Joint Spring 2012 Meeting of the Texas Sections of the APS and AAPT and Zone 13 of the SPS
San Angelo, Texas
http://www.aps.org/meetings/meeting.cfm?name=TSS12
**Friday, March 23, 2012 8:30AM - 9:42AM —**

Session A1 Plenary Session I  Houston Harte University Center UC 100 - Andrew Wallace, Angelo State University

**8:30AM A1.00001 The Pursuit of Quantum Gravity**  
CECILE DEWITT-MORETTE, University of Texas at Austin — Why is it so difficult to make a Quantum Theory of Gravitation? What is the key idea of Einstein theory of gravitation? I have selected three (simple) problems that can be solved and are relevant to these issues: 1. The nonanalyticity of semi classical approximations (or the sex life of the male moth) 2. The Pin Group (or the implication of the quantum phase in particle physics) 3. Spacetime is Space x Time (or the deflection of light by the Sun) Conclusion: La joie de l’ame est dans l’action Lyautey (or astronomical observations)

**9:06AM A1.00002 Advanced LIGO: The next generation of gravitational wave observatories**  
CRISTINA TORRES1, University of Texas at Brownsville — First generation gravitational wave(GW) detectors reached their goals for sensitivity, and have been producing interesting scientific results. Yet current detectors have not made a GW detection, but a new generation of GW detectors, currently under construction, will be poised to make this elusive detection. These new instruments should provide a factor of 10 sensitivity improvement, along with an improved detection bandwidth. As a result, the expected detection rate for a GW detector network should increase by a factor of 1000. This should make for very rich and exciting high quality scientific results in the not so distant future. We will present an overview of LIGO detectors, and showcase the current efforts to improve these detectors. Also in this talk we will showcase the new technologies used to achieve this improvements for the Advanced LIGO project. We will also discuss the status of Advanced LIGO and its prospects for its next science data collection.

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**10:00AM - 10:00AM —**

Session B1 Poster Session  Houston Harte University Center UC 205 (WTC Gallery) -

**B1.00001 Compression of Cake**  
SARAH NASON2, BRITTANY HOUGHTON3, TIMOTHY RENFRO4, McMurry University, MCMURRY UNIVERSITY TEAM5 — The fall university physics class, at McMurry University, created a compression modulus experiment that even high school students could do. The class came up with this idea after a Young’s modulus experiment which involved stretching wire. A question was raised of what would happen if we compressed something else? We created our own Young’s modulus experiment, but in a more entertaining way. The experiment involves measuring the height of a cake both before and after a weight has been applied to the cake. We worked to derive the compression modulus by applying weight to a cake. In the end, we had our experimental cake and, ate it too!

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**B1.00002 Numerical Solution of the Boundary Problem for 2D Laplace Equation for Electrostatic Potential in Given Geometry**  
JARED LAND, JEREMY LAND, SHEHARYAR KHAN, McMurry University — This work has been performed as a student project for the upper division Electricity & Magnetism course. The objective was to numerically model the potential grid and the electric field of 2-dimensional capacitors of various geometries and compare them to the experimental data. This has been accomplished by the implementation of finite difference Gauss-Seidel iteration method through the use of the C programming language. Numeric results were then compared to experimental data. The expectations for this project were to successfully simulate the mapping of the experimental potential grid and electric field through the program code. The final results were satisfying since they closely resemble measured potentials.

**B1.00003 Electromagnetic Accelerator**  
JARED LAND, McMurry University — The objective of this senior physics student research project was to design a functional electromagnetic accelerator (i.e. railgun), with considerations for size, portability, modularity, and weight. This has been accomplished through practical design application of electromagnetic principles and streamlined construction to study effects of various rail geometries/bore profiles, and projectile design. The railgun has been tested and its efficiency has been studied.

**B1.00004 Christmas Light Display**  
ARTHUR ROSS, TIMOTHY RENFRO1, McMurry University — The Digital Electronics class at McMurry University created a Christmas light display that toggles the power of different strands of lights, according to what frequencies are played in a song, as an example of an analog to digital circuit. This was accomplished using a BA3830S IC six-band audio filter and six solid-state relays.

**B1.00005 Explorations in Chaos Physics**  
ARMANDO MALDONADO, DAVID BIXLER, Angelo State University — Chaos Theory is an interesting and important branch of physics. Many physical systems, such as weather or fluid flow, exhibit chaotic behavior. Experiments in simple mechanical or electrical systems, as well as simple simulations can be used as methods of studying chaos. Using a mechanical method, we connected a speaker and to a frequency modulator to bounce a table tennis ball. We recorded the ball’s motion at different frequencies using a video camera. Using Tracker software we observed it’s position versus it’s velocity in order to analyze its chaotic behavior. For a simple simulation, we used the visual-based programming in LabView to examine chaotic behavior produced by some non-linear differential equations. Results from both the mechanical system and the simulations will be discussed. For future work, we plan to continue to explore some chaotic simulations and perform a sequence of experiments with an electrical system. Exploring these nonlinear chaotic systems can help us to better understand and model many phenomena found in nature.
B1.00006 Angular distribution of bremsstrahlung produced by electrons with initial energies in the range from 10 to 20 keV incident on thick Ag, DANIEL GONZALES, BRANDON CAVNESS, SCOTT WILLIAMS, Angelo State University — Experimental results are presented comparing the intensities of the thick-target bremsstrahlung produced by electrons with initial energies ranging from 10 to 20 keV incident on Ag, measured at forward angles in the range of 0 to 55 degrees. When the data are corrected for attenuation due to photon absorption within the target, the results indicate that the detected radiation is distributed anisotropically only at photon energies $k$ that are approximately equal to the initial energy of the incident electrons $E_0$. The results of our experiments suggest that, as $k/E_0 \rightarrow 0$, the detected radiation essentially becomes isotropic due primarily to the scattering of electrons within the target. Comparison to the theory of Kissel et al. [At. Data Nucl. Data Tables 28, 381 (1983)] suggests that the angular distribution of bremsstrahlung emitted by electrons incident on thick targets is similar to the angular distribution of bremsstrahlung emitted by electrons incident on free-atom targets only when $k/E_0 \approx 1$. The experimental data also are in approximate agreement with the angular distribution predictions of the Monte Carlo program PENELOPE.

B1.00007 Effects of hydrogen and amorphous carbon on the microwave absorption of carbon nanotubes, C.R. SAYAVEDRA, D. GONZALES, B.S. CAVNESS, S. WILLIAMS, Angelo State University — Plans for experiments studying the effects of hydrogen on the microwave absorption of carbon nanotubes are described, including details concerning the construction of experimental apparatus. Previous studies have shown that carbon nanotubes emit infrared, visible, and ultraviolet radiation under microwave fields. Theoretical studies of this phenomenon have suggested that either vibrational resonances or interactions of the microwaves with metal catalysts are responsible for the observed radiation emission. Our plans involve comparing the emission spectra for unpurified carbon nanotubes synthesized via arc-discharge using nickel and cobalt catalysts with single-walled carbon nanotubes synthesized via chemical vapor deposition using iron catalyst. Additionally, the emission spectra of samples that have undergone hydrogen absorption will be compared to samples that have not as part of an effort to help understand the mechanism(s) responsible for the exothermic reactions observed when nanotubes are irradiated with microwaves.

B1.00008 Monitoring metal catalyst content of carbon nanotubes during purification using X-ray fluorescence, BRANDON CAVNESS, JOSHUA HEIMBECKER, Angelo State University, JOE VELASQUEZ, Angelo State University / Los Alamos National Laboratory, SCOTT WILLIAMS, Angelo State University — There have been many studies that suggest that catalyst metals in carbon nanotubes (CNTs) may pose a health threat. As there are several potential applications of CNTs in medicine, it is important to be able to quantitatively determine the amount of catalyst contained in a CNT sample. The relative catalyst content of carbon nanotube samples synthesized via arc-discharge has been determined at various stages of the purification process using X-ray fluorescence (XRF) analysis. Purification was achieved by immersing samples in heated nitric acid. The intensities of the nickel Kα X-rays were used to determine the relative catalyst content in the samples. Scanning electron microscopy (SEM) images of purified nanotubes have been compared to the images of a sample that has been irradiated by 0–15keV bremsstrahlung in order to determine if the XRF analysis of the nanotubes is in any way destructive. No obvious structural defects were observed as the result of irradiation.

1 Joe Velasquez and Joshua Heimbecker wish to thank the Welch Foundation for supporting portions of this work through an Angelo State University Chemistry and Biochemistry Departmental Grant.

B1.00009 Design of an experiment to study optically-active centers in diamond nanoparticles, ANKIT SINGH, KUNAL TIWARI, SURESH SHARMA, UT Arlington — The silicon-vacancy (SiV) and nitrogen-vacancy (NV) complexes in diamond nanoparticles (NPs) are optically active centers, which produce single photon events. These centers may be formed when a silicon atom from the silicon substrate often used in CVD growth or nitrogen from impurities in the feed gas ends up next to a vacancy in the diamond lattice. Because of their stability and high quantum efficiency, SiV and NV centers in diamond NPs are attractive for applications in quantum computing, opto-electronics, biotechnology, and medicine. We briefly review our recently published results on diamond NPs, describe the design of an experimental system for carrying out in-situ optical spectroscopy and time-correlation measurements, and show preliminary photoluminescence data.


B1.00010 Variable Star Search Using ROTSE3 Data, FARLEY FERRANTE, ROBERT KEOHE, Southern Methodist University — I present results of a variable star search using data from the Robotic Optical Transient Search Experiment 3 (ROTSE3) telescopes. Variable stars vary in magnitude as seen from Earth due to changes in the star’s luminosity or to changes in the amount of the star’s light that reaches Earth. My research is focused on analysis of the time variation of optical light output as recorded in ROTSE 3 images. Specifically, I am attempting to identify short-period variable candidates such as delta Scuti stars, eclipsing binary stars, and contact binary stars. Amplitude variations for these classes of variables are on the order of one magnitude or less with periods on the order of two to five hours. The ROTSE3 telescope sensitivity holds the promise of significantly extending our reach to dimmer objects than previous searches.

B1.00011 X-Ray Emission From SN Ia 1885A & 1986G, MELODY PACKARD, E.M. SCHLEGEL, D. PATNAUDE, S. KATSUDA, R. PETRE, San Antonio College — X-ray emission is expected from the explosion and subsequent evolution of a Type Ia supernova. The ongoing shock will run into circumstellar material from early phases of the progenitor’s evolution and generate X-ray emission from the interaction. To date, Type Ia supernovae have not been convincingly detected as X-ray sources. A number of remnants in the Milky Way are X-ray sources (eg, SN1006, Tycho). The question of when Type Ia supernovae become X-ray-emitting remnants remains open. We analyze and discuss the available Chandra X-ray Observatory data on two old Type Ia supernovae, SN1885A in M31 and SN1986G in NGC 5128 (= Cen A).

B1.00012 Comparison of polar cap potential from AMIE and DMSP, PHU NGUYEN, JAMIE STERRETT, KEVIN PHAM, RAMON LOPEZ, Univ. of Texas at Arlington — There exists a voltage across the polar cap due to electrons generated from the interaction of the solar wind and Earth’s magnetic field, known as the cross polar cap potential (CPCP). As satellites fly across the Earth’s polar cap, they can indirectly measure the CPCP. The CPCP can also be estimated from measurements of magnetic perturbations on the ground due to electric currents in the ionosphere. We will present a comparison between the CPCP measured from the F13 satellite of the Defense Meteorological Satellite Program (DMSP) and the CPCP calculated from the Assimilative Mapping of Ionospheric Electrodynamics (AMIE) model. The comparisons will be binned into various solar wind conditions to determine the conditions under which the space-based DMSP measurement agrees with the ground-based AMIE model and when they differ.
B1.00013 Comparing the ionospheric cross-polar cap potential from an assimilative model to a semi-empirical equation. CEZANNE NARCISSE, JOSEPH SCHINCO, KYLE VAN ZUIDEN, ROBERT BRUNTZ, RAMON LOPEZ, Univ. of Texas at Arlington — The cross-polar cap potential (CPCP) in Earth’s ionosphere is often used as an indicator of the level of interaction between the solar wind and Earth’s magnetic field. Measuring the CPCP directly is often difficult, requiring other approaches. One way of obtaining the CPCP is to combine data from various sources, such as is done with the Assimilative Mapping of Ionospheric Electrodynamics (AMIE) model. Another method is to run computer simulations with real solar wind measurements as input. Recent research indicates that the Weimer (2005) empirical model’s CPCP values hit a minimum “floor” value for certain solar wind conditions, while the Lyon-Fedder-Mobarry (LFM) simulation finds that the CPCP can continue to drop below that value. We are comparing data from the AMIE model to the Bruntz et al. (2012) formula for the viscous interaction between the solar wind and Earth’s magnetosphere. To see whether AMIE also has a floor value, like the Weimer (2005) model, or whether the AMIE CPCP can continue to drop, as is seen in LFM.

B1.00014 Study on the KCl Fluorescent X-rays for the MicroX Imaging Rocket\(^1\). JOSE A. RODRIGUEZ LOPEZ, University of Texas at El Paso, ENECTALI FIGUEROA-FELICIANO, STEVEN W. LEMAN, STEVEN KISSEL, Massachusetts Institute of Technology — The Micro-X High Resolution Microcalorimeter X-ray Imaging Rocket (Micro-X) is an experiment that combines transition-edge-sensors (TES) with a conical imaging mirror, to obtain high-spectral-resolution images of extended X-ray sources. An Fe-55 source will be set on-board to fluoresce a KCl ring to provide calibration lines of 2.62, 2.81, 3.31 and 3.56 keV, these lines will not interfere with the energy band that Micro-X intends to observe, which is from 0.3 to 2.5 keV. An extensive study has been conducted on how the event rate varies when filters of different materials are put in front of the KCl ring. This study was conducted using charge-coupled-devices (CCD), which are commonly used to detect X-ray events with different energies. The study showed that the source plus a single layer of aluminized mylar (thickness 0.01 mm) will provide enough counts of the desired C(\(\alpha\)), C(\(\beta\)), K(\(\alpha\)), and K(\(\beta\)) lines with little to no events in the 0 to 2 keV energy band.

\(^1\)I would like to thank the Massachusetts Institute of Technology Summer Program for the economic support in this project. This work was funded in part by NASA under Grant No. NNX10AE25G.

B1.00015 An optimized theory for charged macroions immersed in a molecular electrolyte\(^1\). DAMIEN VILLARREAL, ZAVEN OVANESYAN, MARCELO MARUCHO, Department of Physics and Astronomy, University of Texas at San Antonio — Widespread work in theory, experiment, and computation has been carried out to gain a fundamental understanding of the rich, yet sometimes counterintuitive, behavior of charged macroions immersed in a molecular electrolyte. Due to strong interactions with the macroion surface and with each other, screening Z-ions are not positioned randomly in 3D space, but form a strongly correlated liquid on the surface of the macroion. Hence, a detailed knowledge of the structural arrangement \(g(r)\) of ions and water molecules in the vicinity of a macroion is of crucial importance to get a microscopic understanding of polyelectrolyte systems. To achieve this, novel computational methods are required to treat the solvent effects on macroions at the atomic level. In this poster, we present an approximation optimized for integral equation theories to compute \(g(r)\) for molecular fluids. It is especially designed to take advantage and eliminate deficiencies present in old, but still used approximations, including HNC and PY. As a preliminary test, we calculate correlation functions \(g(r)\) for spherical nanoparticles immersed in an aqueous electrolyte, achieving a compromise between accuracy and computational cost without suffering the limitations demanded by full atomistic simulation calculations.

\(^1\)NSF - PREM

B1.00016 Nano-mechanics of prostate cancer cells on nano-scaffolds. LYNDON BASTATAS, JAMES MATTHEWS, Texas Tech University, JOOD HASHEM, SOUAD SENNOUNE, RAUL ZANGUILLAN-MARTINEZ, Texas Tech University - Health Science Center, SOYEUN PARK, Texas Tech University — We investigated the nano-mechanics of lowly metastatic (LNCaP) and highly metastatic (CL-1) prostate cancer cells cultured on nano-scaffolds by performing AFM indenting experiments. The functionalized nano-scaffolds allowed us to control the cell-to-substrate adhesion, hence the focal adhesion. We measured the elastic moduli at the center of the cell in different adhesion sizes of the nano-arrays. The obtained mechanical signature indicates that smaller focal adhesion could elicit apoptosis. This study, in general, demonstrates that nano-scaffolds could be used as a tool for adhesion assay and as a metastatic indicator.

B1.00017 Absorbance Differentiation of Burned and Normal Tissue by the Addition of Glycerol\(^1\). CHUAN-I. CHANG, HECTOR DE PEDRO, FARANAK ZARNANI, Physics Department, The University of Texas at Dallas, AHAMED IDRIS, Department of Surgery (Emergency Medicine), The University of Texas Southwestern Medical Center at Dallas, R. GLOSSER, Physics Department, The University of Texas at Dallas — Minimizing the removal of healthy/recoverable tissue would significantly increase the chances of the patients’ survival. The purpose is to be able to optically differentiate between burned and normal tissue with the addition of glycerol. Under normal conditions (without glycerol), the absorption coefficient is large, which means there is a large amount of absorption in the tissue. Glycerol decreases the absorption coefficient by reducing the cell size as well as providing a more uniform index of refraction in the interstitial environment. A lower overall absorption will reveal absorption peaks specific to the differentiation of the tissue. Results will be presented on the day of the conference.

\(^1\)We would like to thank The University of Texas at Dallas Undergraduate Research Scholarship Award Program and The University of Texas Southwestern Medical Center at Dallas for their support.

B1.00018 Absolute Theory of Relativity. FLORENTIN SMARANDACHE, University of New Mexico — We redo Einstein’s thought experiment with atomic clocks from the Special Theory of Relativity. Herein we consider an absolute time and an absolute space but no ultimate speed, and we call it Absolute Theory of Relativity (ATR). Our ATR is free from time dilation, space contraction, relative simultaneity, and relativistic paradoxes.

B1.00019 ABSTRACT WITHDRAWN —
B1.00020 Pressure induced structural transitions in Lead Chalcogenides and its influence on thermoelectric properties . JOHN PETERSEN, MICHAEL SPINKS, Department of Physics, Texas State University, San Marcos, Texas, PABLO BORGES, Instituto de Ciências Exatas e Tec., Universidade Federal de Viçosa, Rio Paranaiba, MG, Brazil, LUISA SCOLFARO, Department of Physics, Texas State University, San Marcos, Texas — Lead chalcogenides, most notably PbTe and PbSe, have become an active area of research due to their thermoelectric (TE) properties. The high figure of merit (ZT) of these materials has brought much attention to them, due to their ability to convert waste heat into electricity, with a possible application being in engine exhaust. Here, we examine the effects of altering the lattice parameter on total ground state energy and the band gap using first principles calculations performed within Density Functional Theory and the Projector Augmented Wave approach and the Vienna Ab-initio Simulation Package (VASP-PAW) code. Both PbTe and PbSe, in NaCl, orthorhombic, and CsCl structures are considered. It is found that altering the lattice parameter, which is analogous to applying external pressure on the material experimentally, has notable effects on both ground state energy and the band gap. The implications of this behavior in the TE properties of these materials are analyzed.

B1.00021 ABSTRACT WITHDRAWN —

B1.00022 ABSTRACT WITHDRAWN —

B1.00023 First-Principles Study of Properties of the Oxidized Cu(110) and Cu(111) Surfaces , ANTOINE OLENGA, N.G. FAZLEEV, Department of Physics, University of Texas at Arlington — The adsorption of oxygen on transition metal surfaces is important for the understanding of oxidation, heterogeneous catalysis, and metal corrosion. In this work we have studied from first principles the changes of electronic properties of the Cu(110) and Cu(111) surfaces due to oxygen adsorption. Especially, we have focused on studies of changes in the work function, electronic density, interlayer spacing, density of states and band structure with oxygen coverage. Calculations of electronic properties from first principles have been also performed for the (110) and (111) surfaces of Cu2O to use for comparison. The first-principles calculations in this work have been performed on the basis of the Density Functional Theory and using DMO13 code. The obtained theoretical results have been compared with available experimental data.

B1.00024 ABSTRACT WITHDRAWN —

B1.00025 QMSA Measurements of III-V Heterostructures on Silicon , THIELS CUNNINGHAM, Texas State University, RICHARD HILL, MAN HOI WONG, SEMATECH, RAVI DROOPAD, Texas State University, TEXAS STATE UNIVERSITY TEAM1, SEMATECH TEAM2 — There is widespread consensus that high mobility III-V channel materials will enable increased performance and reduced power consumption at scaled geometries [1]. The industry is currently targeting the 11 nm technology node for their introduction. One of the most significant challenges is the heterointegration of III-V channel materials on Si substrates, which is essential to access large diameter cost effective silicon substrates. We compare carrier transport of MBE grown InGaAs/InAlAs HEMTs on InP and Si substrates using Quantitative Mobility Spectrum Analysis (QMSA). Measurements were taken to determine the effect of epitaxial defects on channel transport and buffer leakage. The continued scaling of Si CMOS devices has reached the point where, alternative solutions to the conventional MOSFET device need to be found. One solution being considered is the use of III-V compound semiconductors as the channel materials. However, the requirement is that these materials need to be epitaxially integrated onto silicon and be able to withstand the thermal budget in the various CMOS processing modules. In this presentation, we will present the electrical characterization of MBE grown III-V InGaAs/InAlAs heterostructures on silicon. Transport measurements at various temperatures ranging from 10K-room temperature in magnetic fields from 0-10T. From these measurements, QMSA of the data is carried out to the densities and mobilities of the conducting and buffer layers.

1Dept. of Physics, Texas State University-San Marcos, TX 78666
2SEMATECH, 2706 Montopolis Drive, Austin, TX

B1.00026 Hydroelectric Generator , DANIEL ZIPPRIAN, None — The idea behind a hydro electric generator is to have a large potential well of water that you can be withdrawn to be able to convert into kinetic energy. The kinetic energy is from the flow of water which is directed towards some kind of turbine. In turn the kinetic energy is turned into mechanical energy. The turning of the turbine rotates the rotor part of the generator, and the stator remains stationary. Induction is caused when the rotor is rotating around the stator. This is caused when a magnetic field interacts with a wire causing the electrons inside the wire to face in the same direction. Once the magnetic field begins to move the electrons start to flow through the wire creating current. For this to work the direction of the magnetic field has to be perpendicular to the direction of the coils of wires. For my design I plan to funnel the flow of water into a nozzle which will be aimed towards my turbine. The turbine will be connected to a shaft that will be connected to my rotor. The rotor I designed uses a brake router for the surface to hold me magnets. The system will be vertical, with the rotor as the highest part on the generator and the turbine at the bottom. The magnets will be facing downwards with the magnetic field going in a vertical direction. The stator of my generator will be the coils which will sit on top of a metal ring that have the ability to rise or low to match the height of the brake router.

B1.00027 Comparing MRT scores of introductory STEM classes with a higher-level physics class , ELIJAH MURPHY, THAD LOFTIS, Univ. of Texas at Arlington, XIMENA CID, University of Washington, RAMON LOPEZ, Univ. of Texas at Arlington — Science, technology, engineering, and math (STEM) classes require students to use mental spatial skills and reasoning. We can objectively measure a student’s mental spatial skills with a Mental Rotation Test (MRT). We compared MRT scores for students in introductory chemistry, math, and physics classes against scores for students in an upper level physics course and found that the upper level physics students scored better on the MRT on average than the introductory students. We have also found a small correlation between students’ performance in the upper lever class, as measured by final grades, and the students’ MRT scores.

B1.00028 The Influence of Photolysis Rate Constants in Ozone Production for the Paso del Norte Region , FERNANDO BECERRA, ROSA FITZGERALD, UTEP — In this research work we are focusing on understanding the relationship between photolysis rates and the photochemical ozone changes observed in the Paso del Norte region. The city of El Paso, Texas together with Ciudad Juarez, Mexico, forms the largest contiguous bi-national metropolitan area. This region suffers year-round ozone pollution events, and a better understanding is needed to mitigate them. Previous studies have found that ambient ozone concentrations tend to be higher on weekends rather than on weekdays, this phenomenon being referred to, as the “weekend effect.” If the ozone standard is exceeded more frequently on weekends, then this phenomenon must be considered in the design of ozone control strategies. In this work we investigate some of the most representative weekend ozone episodes at El Paso, TX, during the years 2009, 2010 and 2011 using the ozone photolysis rates. In this research the TUV radiative-transfer model is used to calculate the local photolysis rates and a UV MFRRS instrument is used to obtain experimental parameters. Seasonal variations and the weekend-weekday effect is studied. The results of this research will help to understand the underlying behavior of the photolysis rate constants when different atmospheric conditions are present.
Comparing the Brunz et al. (2012) viscous potential formula to the ionospheric cross-polar cap potential from two empirical formulas

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Octantis has been a system of great controversy since the suggested planet in this system (Ramm et al. 2009) has been associated with the detection of a circumbinary planet of Kepler-16b (Doyle et al. 2011)\[Science 333, 1602\]. Planets in binary systems have warranted second and even third measurements to determine the short and long-term stability of a prograde starting configuration. However, to follow up on the previous results by Eberle & Cuntz (2010)[ApJ 721, L168], we have investigated the hypothesis of a retrograde orbit in more detail by considering a larger set of possible initial conditions to determine the possibility of a retrograde configuration with respect to the motion of the binary system. We will show that a retrograde configuration is preferred by both stability considerations with respect to the maximum Lyapunov exponent and numerical statistical considerations.

This work has been supported by the U.S. Department of Education under GAANN Grant No. P200A090284 (B. Q.), the SETI institute (M. C.) and the Alexander von Humboldt Foundation (Z. E. M.).

We thank the AAS for support through a Small Research Grant.

Photometric Search for Variables in DD9 with STExTS

The Small Telescope Extrasolar Transit Searches (STExTS) project is a small aperture, wide-angle search for planetary transits and variable stars. Observations of the open cluster Dolidze-Dzimseleshvili 9 were made with an f/2.8 152 mm astrograph for 37 nights using a f/2.8 152 mm astrograph. Approximately 11,000 images were obtained, processed, and analyzed for signatures of transits. We will present preliminary candidates and orbital periods.

Small Telescope Exoplanet Transit Search (STExTS) Transit Candidates in the Open Cluster Dolidze-Dzimsevijli 9 (DD9)

Automation of the Telescope in the Observatory at Texas State University-San Marcos

The telescope in the Observatory at Texas State University-San Marcos is automated by means of off the shelf parts with a budget of $300.00. This telescope retrofit is to replace obsolete and malfunctioning hardware and update software. The telescope upgrade entailed the removal of all of the timeworn hardware and thorough testing of the motors and encoders to insure proper functionality. From a less expensive telescope a new motor control board is acquired that is capable of performing tasks beyond the capabilities of the old board. A Schmitt Trigger and a set of four capacitors in series are used to lessen the noise produced by the older model motors and encoders. All of the retrofitted hardware is tested to insure proper functionality for the final product before installation into the telescope. After final installation a problem with the communication between software and hardware was found and remedied.
higher sensitivity for WIMP search with very little expected background. The next generation SuperCDMS experiment utilizing more advanced detector technology is expected to have much of our data shows no strong evidence of possible WIMP signature, and rejects the observation of similar phenomenon in CoGeNT at more than 95% confidence level. The Cryogenic Dark Matter Search (CDMS) experiment uses photo-lithographically patterned Ge detectors with Transition Edge Sensors (TES) that are operated at 50mK temperature, to look for possible recoil with the slow moving WIMPs in our galaxy. This talk will present recent advances in the detector technology with a new dedicated nano-fabrication facility set up at Texas A&M University. Constraints on Low-Mass WIMP signals from CDMS, KUNJ PRASAD, Texas A&M University, CRYOGENIC DARK MATTER SEARCH COLLABORATION — Dark Matter constitutes more than 80% of matter content in known universe. A major candidate to Dark Matter is Weakly Interacting Massive Particle (WIMP). The Cryogenic Dark Matter Search (CDMS) experiment uses cryogenically cooled Germanium detectors to look for recoil signals with the slow moving WIMPs in our galaxy. The most recent results optimized for high mass WIMPs yielded 2 possible candidates, which were statistically consistent with expected background. An updated analysis optimized for low mass WIMP search showed no evidence of low mass WIMPs and disfavors an explanation for the DAMA/LIBRA and CoGeNT signals in terms of spin-independent elastic scattering of low-mass WIMP. Search for annual modulation of our data shows no strong evidence of possible WIMP signature, and rejects the observation of similar phenomenon in CoGeNT at more than 95% confidence level. The next generation SuperCDMS experiment utilizing more advanced detector technology is expected to have much higher sensitivity for WIMP search with very little expected background.

CDMS WIMP detector Fabrication Optimization, ANDREW JASTRAM, Texas A&M University, CDMS COLLABORATION — Less than 20% of the matter content in the Universe is made up of what we know as ordinary matter, the rest is dominated by Dark Matter. The major candidate constituent of Dark Matter is the Weakly Interacting Massive Particle (WIMP). The Cryogenic Dark Matter Search (CDMS) experiment uses photo-lithographically patterned Ge detectors with Transition Edge Sensors (TES) that are operated at 50mK temperature, to look for possible recoil with the slow moving WIMPs in our galaxy. This talk will present recent advances in the detector technology with a new dedicated nano-fabrication facility set up at Texas A&M University.

Characterization of GEM Digital Hadron Calorimeter with 13 bit KPiX Readout System Using Particle Beams, SAFAT KHALED, University of Texas At Arlington — The High Energy Physics Group at the University of Texas at Arlington has been developing a digital hadron calorimeter (DHCAL) for future linear colliders using double-layer Gas Electron Multiplier (GEM) detector in the sensitive gap. The group has built prototype double GEM detectors in several sizes and have exposed four 30cm x 30cm prototype GEM detectors to particle beams at Fermi National Accelerator Laboratory. The high energy physics group has been developing prototype GEM detectors which contain two layers of GEM foils. The team performed a two week long beam test of four prototype chambers with dimensions 30cm by 30cm at Fermi National Accelerator Laboratory in August of 2011. Three of these chambers were equipped with the one bit DCAL chip readout system jointly developed by Argonne National Laboratory and Fermi National Accelerator Laboratory teams. In this talk, we give an updated report of the results of the test beam data analysis of the GEM prototype detector functionality, responses to various particle types, efficiency dependence on threshold and high voltage, as well as the current/future studies that the UTA team is performing with the GEM detectors and DCAL readout system.

A study of systematic uncertainties for Higgs Boson Searches in $H \rightarrow \gamma \gamma$ and $H \rightarrow W^+W^- \rightarrow l^+\nu l^-\nu$ Final States in ATLAS, HEE YEUN KIM, University of Texas at Arlington, JAEOHOO HU, ATLAS Collaboration — This study focuses on the theoretical systematic uncertainties for Higgs particle searches in $H \rightarrow \gamma \gamma$ and $H \rightarrow W^+W^- \rightarrow l^+\nu l^-\nu$ channels at ATLAS and for background processes. The precision of Monte Carlo event generator predictions benefit dramatically from the inclusion of higher-order corrections in various ways in total and differential cross sections. In this study, two different combinations of Monte-Carlo tools, PowhegBox-Pythia and PowhegBox-Herwig, are used with various Parton Distribution Function sets in CTEQ6.6 and MSTW2008NLO for systematic uncertainties resulting from parton showering and PDF uncertainties. Large scale Monte-Carlo event simulations have been performed to estimate the background. Cut based analyses have been done and theoretical predictions have been compared to the 2011 ATLAS data. This enables us to understand the underlying parton dynamics in the processes, and to quantify the theoretical systematic uncertainties in background estimates and Higgs signal cross sections.

$^1$ATLAS collaboration
11:18AM C2.00005 Search for NMSSM Higgs production with the CMS detector, AYSEN TATARINOV, Texas A&M University, CMS COLLABORATION — Light bosons weakly coupling to the Standard Model may appear in the context of Next-to-Minimal Supersymmetric Model (NMSSM), which could resolve the tension between direct and indirect measurements of the Higgs mass. We present a search for the lightest CP-even Higgs boson (h1) decaying into two lightest CP-odd Higgs bosons (a1), followed by their decays into two pairs of collimated muons in the NMSSM. The search covers the lightest CP-odd Higgs boson (a1) mass from 0.25 to 3.5 GeV/c² and sets upper limits on NMSSM Higgs boson production (σg→h1). It was performed using pp collisions data recorded by the CMS experiment at the LHC, at center-of-mass energy of 7 TeV, and corresponding to an integrated luminosity of 4.9 fb⁻¹.

11:30AM C2.00006 Measurement of properties of the Z and W bosons from the ATLAS experiment, LAST FEREMENGA, JAEHOON YU, University of Texas at Arlington, HIGGS SEARCH TEAM — We present the results from a study of the kinematic properties of the W and Z bosons produced in proton-proton collisions at the Large Hadron Collider at the European Center for Nuclear and Particle physics, CERN, Geneva, Switzerland. In particular, we present the measured mass distribution of these two particles from the most current data from the ATLAS experiment, and compare them with the theoretical predictions. Although the properties of the Z boson are very well known, those of the W boson are known to uncertainties of about ten times that of the Z bosons. Improved results of W and Z boson properties are presented.

11:42AM C2.00007 Current Progress in Fabrication of a 14 Tesla Nb₃Sn Dipole, EDDIE HOLIK III, CHRISTOPHER BENSON, KYLE DAMBORSKY, NICK DIACZENKO, TIM ELLIOTT, RAY GARRISON, ANDREW JAILLE, ALFRED MCINTURFF, PETER MCINTYRE, DIOR SATTAROV, Texas A&M University — The Accelerator Technology Laboratory at Texas A&M is fabricating a model dipole magnet, TAMU3, designed to operate at a 14 Tesla bore field. The dipole employs an advanced internal-tin Nb₃Sn/Cu composite strand with enhanced current density. The coils must be processed through a heat treatment after winding, during which the Sn within the heterogeneous strands diffuses into the Cu/Nb matrix to form high-performance superconducting layers. Heat treatment of the first coil assembly revealed tin leakage from the Sn cores that was caused by omission of a pre-anneal step in the heat treatment. We are evaluating the electrical properties of the coil, the microstructure and short-sample superconducting performance of cut-off samples of current leads to determine the extent of damage to the performance of the windings. Results of these tests and plans for construction of TAMU3 will be presented.

11:54AM C2.00008 Search for high-mass di-tau resonances in pp collisions at √s = 7 TeV, INDARA SUAREZ, Texas A&M University, CMS COLLABORATION — Many well motivated scenarios of physics beyond the Standard Model, such as Grand Unified Theories, models with extra spatial dimensions, and Super symmetry (SUSY) suggest the presence of heavy neutral resonances. While these new particles may have different nature and production mechanism, e.g. heavy SUSY Higgs, Z'-boson or Kaluza-Klein excitations, they all share a similar experimental signature which should be observable at the LHC using dilepton final states. We present a direct search for heavy particles decaying into two taus using data from pp collisions recorded by the CMS experiment at the LHC, at center-of-mass energy of 7 TeV, and corresponding to an integrated luminosity of 4.6 fb⁻¹. The cross section limit was measured using four channels, Z' → ττ, μτ, eτ, and ττ, where no significant excess was observed. Using the Sequential Standard Model Z'-boson as a benchmark, we set a 95% confidence-level upper limit on the mass of 1TeV.

12:06PM C2.00009 Search for Supersymmetry, ANGEL CAMPOVERDE, Stony Brook University — The Standard Model (SM) describes electromagnetic, weak and strong interactions in an almost satisfactory way. However it cannot be the ultimate theory of nature because it does not describe gravitational forces, it cannot explain neutrino oscillations and needs to be forced to give the right mass to the Higgs boson, of which I will talk. There are models that try to expand the SM to solve these problems. One of these is Supersymmetry (SUSY). I will talk about the WZ model, a toy model that describes a system of four particles with a Supersymmetric Lagrangian, I will talk about its key features and how it solves the problems stated before. I will also talk about a particular way in which SUSY can be broken, General Gauge Mediation, and the way how we can use it to search for SUSY particles. Finally I will talk about experimental data related with the search for SUSY.

Friday, March 23, 2012 10:30AM - 11:54AM — Session C3 Contributed Oral Presentations: AAPT 1
Houston Harte University Center UC 211 - Eric Hagedorn, University of Texas at El Paso

10:30AM C3.00001 Report on THECB Decisions Regarding Physics Programs, HEATHER GALLOWAY, Texas State University — In April 2010, the Texas Higher Education Coordinating Board adopted rules requiring bachelor’s programs to produce 25 majors in five years and master’s degree programs to produce 15 in five years. In Fall 2011, a number of physics programs were facing the loss of their programs. Data regarding the decisions will be presented including the effects on non-physics areas. This presentation will focus on the discussion during the Coordinating Board meeting at which these appeals were presented and on the current coalition that is under consideration by the Coordinating Board.

10:42AM C3.00002 10 years after SPIN-UP, ANDREW WALLACE, Angelo State University — As a new department head in 1998 I gained access to institutional data that indicated the BS Physics program at Angelo State University would be extinct by 2006. The Department of Physics implemented several changes to increase enrollment and graduation rates in the BS Physics program. These changes involved curriculum, effectiveness, policy, recruiting, and resources. Today the department has over 160 declared majors and graduates 10-11 per year for the past 5 years. Recent Texas Higher Education Coordinating Board Law Producing program closures, proposed increases in production rates, and new strategic initiatives from the Texas Tech University System will require additional solutions to remain a viable undergraduate physics program in Texas.

10:54AM C3.00003 Simulation Based Conceptual Tutorials for Introductory Physics, PAUL WILLIAMS, Austin Community College — The author has been developing a series of simulation based conceptual tutorials for introductory physics. The goal of the tutorials is to present the conceptual development usually done in lecture with a more learner centered approach. To date, tutorials have been developed on kinematics, force, energy, thermal processes, and the electric field. Some sample activities from the tutorials will be shown and some very preliminary data assessing the effectiveness will be presented.
11:06AM C3.00004 Cognitive Advantages of Blending with Material Anchors in Energy Instruction1, HUNTER CLOSE, ELEANOR CLOSE, Texas State University - San Marcos, RACHEL SCHERR, Seattle Pacific University, SARAH MCKAGAN, McKagan Enterprises, Seattle, WA — Conceptual blending theory [1] explains how the human imagination creates unreal situations that help us think about reality. In these imaginary blended situations, we establish new correspondences, interactions, and dynamics, and the outcomes of the dynamics lend insight to the nature of various real situations that were used to compose the blend. Blends are not just in the head, however; in some cases, a material system participates in the blend by lending its material structure as conceptual structure [2]. In the instructional activity Energy Theater [3], people represent units of energy and move around in order to solve puzzles of energy transfer and transformation. We use the ideas of blending and material anchors to understand how learners are able to use the representation to their cognitive advantage.


1Supported in part by NSF DRL 0822342.

11:18AM C3.00005 Unequivocal Proof Supergirl is Faster Than Superman or The Flash: Inclusion of Women and Minorities in STEM Fields, JIM SIZEMORE, Tyler Junior College — Diversity in physics and engineering, including inclusion of women, is a problem that has been discussed for several decades yet has not found adequate systemic solutions. It is presumed that most physicists and engineers today agree, as evidence supports, that women and minorities have as much intrinsic ability to succeed as men and majority students although some prejudice continues to exist. Therefore, the primary question today becomes how to improve inclusion. Other STEM disciplines, particularly mathematics and medicine, have made great strides including women and it appears inclusion of minorities is improving at a slow rate. In this talk, a review of papers reporting department practices in STEM fields that successfully improved inclusion will be presented. Also specific practices to improve inclusion will be reviewed and presented including the example proving Supergirl is faster than either Superman or The Flash.

11:30AM C3.00006 Engaging physics majors as partners in teaching: Learning Assistants in introductory physics, ELEANOR CLOSE, DAVID DONNELLY, HUNTER CLOSE, Texas State University - San Marcos — This semester we are running a pilot Learning Assistant (LA) program in one section of our introductory calculus-based mechanics course. The LA model of course transformation was developed at the University of Colorado (http://laprogram.colorado.edu/). In our current implementation, five undergraduate physics majors are assisting with tutorial instruction in the lecture section once a week (using primarily Tutorials in Introductory Physics); in addition, most weekly laboratory sections begin with a tutorial. Both LAs and laboratory TAs attend tutorial preparation sessions prior to instruction each week. In this talk we briefly describe the current program, including implementation issues; give an overview of the experiences of the new LAs; and discuss future plans for an expanded LA program. Overall our plan is to improve the experience of being an undergraduate physics student in our department by improving student understanding of physics concepts and by including students as legitimate participants in the mission of the department.

11:42AM C3.00007 Physics Public Engagement—Not Just for Kids Anymore!, TONI SAUNCY, Angelo State University, ANGELO STATE SOCIETY OF PHYSICS STUDENTS TEAM — Engaging the community with physics is a way of developing and supporting a vibrant and strong physics department at Angelo State University. The Society of Physics Students chapter has been actively involved in numerous public engagement activities for over 10 years. These efforts claim to focus on “enhancement of attitude” of the audience participants, but the benefit of these public engagement activities go well beyond getting the younger students excited about science. The more critical need addressed by outreach programs such as ours is getting the undergraduate student presenters engaged as professional scientists, immersed in the true culture of scientific citizenship, and taking ownership of not only the physics they present, but also the impact that they potentially have on the students with which they interact. As undergraduate physics programs across the nation find themselves facing programmatic cuts, the value of engaging undergraduate students in purposeful service as a means of retention in the major should be considered as a standard part of a successful program curriculum.

Friday, March 23, 2012 1:30PM - 2:46PM — Session D1 Invited Oral Presentations: SPS1 Houston Harte University Center UC 100 - Toni Sauny, Angelo State University

1:30PM D1.00001 Physicists’ Trajectories after the Bachelor’s Degree, GARY WHITE, SPS Director/ American Institute of Physics — Data from the Statistical Research Center at the American Institute of Physics and from a survey of members of the national physics honor society, Sigma Pi Sigma, are accumulated to indicate the array of actual career paths taken by physicists. As one might expect, these trajectories are interesting not only for their endpoints, but for the many diversions and attractors along the way.

1:50PM D1.00002 Connecting Worlds: The Transition from Student to Professional, KENDRA REDMOND, American Institute of Physics/Society of Physics Students — College life and the 9-5 day job can sometimes seem like two completely different worlds, yet one of the goals of higher education is to equip students for their career journey. What can physics departments do to help students transition from the world of all-nighters and texting to the world of daily commutes and memos? How can physics students improve their chances of landing a job? This presentation will include a discussion of preliminary findings from the Society of Physics Students Career Pathway project, a project looking at the characteristics of departments that are successfully placing students in STEM careers within one year of earning a bachelors degree.

2:26PM D1.00003 The Physics Degree in an Engineering Career, GEORGE JAMES, NASA Johnson Space Center — This presentation provides four case studies for engineering careers that are initiated with undergraduate Physics degrees. The authors own career and those of three colleagues are used as the case studies (which generally involve Aerospace Engineering careers). The intent is to convey the advantages and disadvantages that the Physics degree provides as well as concepts that a Physics major might build on in moving into another field.
3:00PM E1.00001 Tunneling, Diffusion and Dissociation of Feshbach Molecules in Optical Lattices, TAYLOR BAILEY, CARLOS BERTULANI, Texas A&M University-Commerce, EDDY TIMMERMANS, Los Alamos National Laboratory — We show that tunneling and diffusion of cold Rydberg molecules in optical lattices leads to somewhat unexpected effects. One of these effects is the resilience of the molecules to dissociation as their binding energy decreases. We also quantify the dynamics of molecular diffusion and dissociation of molecules in 1D harmonic optical lattice potential by comparing to analytical models. It is found that after an initial transient, the wave packet for dissociating molecules can be described by a power diffusion pattern of the type \( \sigma(t) \propto t^{1/2} \) where \( \sigma \) is the dispersion of the packet. Surprisingly, we could not obtain such a simple power law fit for the dispersion of dissociated atoms.

3:12PM E1.00002 Superfluorescence of ZnO nanoparticles: a three-level model, POOJA SINGH, YURI ROSTOVTSYEV, Department of Physics, University of North Texas — We have studied fluorescence and second harmonic generation that occur in a three-level system. We have obtained that at approaching to the two-photon resonance, the efficiency of second harmonic generation is decreasing and intensity of resonant fluorescence is increasing. Under some condition, superfluorescence regime leads to generation of short intense pulses under two-photon excitation (duration of the pulses are shorter than the relaxation times). The obtained results are applied to ZnO nanoparticles to explain the experimentally observed behavior of second harmonic generation and two-photon emission excited by fs-laser pulses.

3:24PM E1.00003 Studying the Proton Spin Puzzle with PHENIX, MICHAEL DAUGHERITY, Abilene Christian University, PHENIX COLLABORATION — The proton spin puzzle remains one of the biggest mysteries in fundamental particle physics today. This talk will explore how the PHENIX Collaboration’s forward W-boson program uses RHIC, the world’s only polarized proton-proton collider, to probe the spin structure of the proton.

4:00PM E1.00004 Optically Controllable Photonic Structures, ALEXANDER WALDROP, CHRIS O’BRIEN, OLGA KOCHAROVSKAYA, Department of Physics and Astronomy, Texas A&M University — Coherent control of the refractive index with vanishing absorption in multilevel systems was a subject of intense recent theoretical and experimental studies [1-3]. We suggest an attractive possibility to use such coherent control of refractive index for optical production and control of photonic structures in the resonant homogeneously distributed in space atoms. The idea is based on spatial modulation of a populated intermediate level position in three-level atoms in nearly degenerate ladder configuration leading to periodic resonant increase and decrease of the refractive index simultaneously keeping zero absorption/gain. Modulation of an intermediate level position is provided by an external standing wave of a laser field via ac-Stark effect allowing one for both optical production and efficient optical control of the proposed method in rare-earth doped crystals with excited state absorption is considered.


4:18PM E1.00005 Sample topography measurements by a novel image processing algorithm, BRYANT AARON, DAN TAMIR, Department of Computer Science, JAVAD R. GATABI, WILHELMUS GEERTS, Department of Physics, R.K. PANDEY, Department of Electrical Engineering, Texas State University at San Marcos — An exposure tool for lithography on non-flat samples is being developed. The pattern is directly written in a photoresist plated sample by moving the sample under a focused laser beam. During the writing process the topography of the surface is measured and a parametric model of the 3D surface is generated to allow for corrections of the exposure dose, the focus, and the direction of the light incident upon the sample. The system uses image processing techniques for estimating the distance of points on the surface to the objective. An illumination pattern consisting of four squares is projected on the surface of the sample. Images are taken with a high speed SCMOS camera. The topography of the sample is estimated from the measurements of the contrast around the projected patterns. To determine the contrast the k-means algorithm with k=2 is applied. The algorithm groups pixels into two clusters and the contrast is determined from average pixel values in high (u) and low intensity (v) clusters using \( (u-v)/Max \); where Max is the maximum pixel value detected in the image. Slope and focus quality are determined from the measured contrast values. The authors would like to thank NSF for financial support (grant: 0923506).

4:30PM E1.00006 Three Dimensional Surface Topography Using LCD Pattern Transfer Method, JAVAD R. GATABI, WILHELMUS GEERTS, Department of Physics, BRYANT AARON, DAN TAMIR, Department of Computer Science, R.K. PANDEY, Department of Electrical Engineering, Texas State University — Laser lithography on curved surfaces has recently been researched due to its applicability in production processes for devices that combine integrated optical, mechanical, magnetic, and/or electronic technologies. Several laser lithography methods have been reported for pattern transfer to convex and cylindrical surfaces, but there is not a general methodology for arbitrary 3D surface lithography. This project implements an optical method for laser lithography on arbitrary 3D surfaces. An illumination pattern generated by a transparent LCD is projected through an optical microscope on top of a 3D surface and recorded by a camera. The focus quality and the distortion of the observed image depend on the local topography of the sample. The effect of the local sample topography on the projected pattern is theoretically investigated using Zemax ray-tracing software. Analysis are made for amplitude and phase modulation LCDs with different resolutions and compared with preliminary experimental results. The authors acknowledge financial support from NSF through an MRI-grant (grant: 0923506).

4:42PM E1.00007 Onset of Marangoni convection of a liquid layer with insoluble surfactant in modulated thermal field, ALEXANDER MIKISHEV, Strayer University - Katy Campus, Houston, TX — A horizontal layer of an incompressible liquid layer bounded by rigid lower plane and free deformable flat upper surface is considered. The layer is heated from below and the heat flux is varying with time around fixed mean value. On the free surface the liquid adsorbs an insoluble surfactant, whose local concentration changes with time due to the advection and diffusion. The linear stability analysis with respect to disturbances of arbitrary finite wave-numbers is performed. Two response modes of the convective system to an external periodic stimulation have been found, the first one with a period of oscillation twice as the period of heat flux modulation (subharmonic mode) and the second one with the same period (synchronous mode). The neutral stability curves are presented for a variety of external conditions. The cellular and long-wave instability thresholds are compared.
4:54PM E1.00008 A Cable Equation Model of Electrical Signal Transmission in Non-uniformly Deformed Nerve Cells1 , EMILY HENDRYX, Angelo State University — In order for the human body to function, neurons must be able to properly transmit electrical signals. One method of modeling this voltage flow is through the cable equation. Assuming that an aneurysm or tumor is present, we modify the cable equation to account for radially asymmetric deformation of a dendrite. Through this modification, we hope to improve our current understanding of overall brain function in the presence of neuronal deformation.

1 Angelo State University Student Research Fellowship

5:06PM E1.00009 Utilizing Functionalized Nano-Patterned Surfaces as a clue to Cell Metastasis in Prostate and Breast Cancer , JAMES MATTHEWS, LYNDON BASTATAS, Texas Tech University — There is a direct relation between the survival of a patient diagnosed with prostate or breast cancer and the metastatic potential of the patient’s cancer. It is therefore extremely important to prognosticate metastatic potentials. In this study we investigated whether the behaviors of cancer cells responding to our state of the art nano-patterns differ by the metastatic potential of the cancer cells. We have used lowly (LNCaP) and highly (CL-1) metastatic human prostate cancer cells and lowly (MCF-7) and highly (MB231) metastatic breast cancer cells. A surface functionalization study was then performed first on uniform gold and glass surfaces, then on gold nano-patterned surfaces made by nano-sphere lithography using nano-spheres in diameter of 200nm to 800nm. The gold surfaces were functionalized with fibronectin (FN) and confirmed through XPS analysis. The CL-1, MCF-7, and MB231 cells show similar proliferation on all surfaces regardless of the presence of FN, whereas LNCaP show a clear preference for FN coated surfaces. The proliferation of the LNCaP was reduced when grown on finer nano-scaffolds, but the more aggressive CL-1, MB231, and MCF-7 cells show an abnormal proliferation regardless of pattern size. The difference in adhesion is intrinsic and was verified through dual fluorescent imaging. Clear co-localization of actin-vinculin were found on CL-1, MCF-7, and MB231. However LNCaP cells showed the co-localization only on the tips of the cells. These results provide vital clues to the bio-mechanical differences between the cancer cells with different metastatic potential.

Friday, March 23, 2012 3:30PM - 5:18PM — Session E2 Contributed Oral Presentations: APS 4 Houston Harte University Center UC 201 - Timothy Renfro, McMurry University

3:30PM E2.00001 First-principles study of the electronic structure of NiS, NiS2, and Ni3S2 , JOAQUIN NOYOLA, QIMING ZHANG, University of Texas at Arlington — First-principles study of the electronic structure of NiS, NiS2, and Ni3S2 are performed. DFT+U and HSE hybrid functional are used as the primary exchange-correlation schemes. The resulting electronic structures at various phases are analyzed, and the results compared with previous experimental and theoretical work.

3:42PM E2.00002 GaN HEMTs , JONATHAN W. ANDERSON, KYOUNG-KEUN LEE, EDWIN L. PINER, Texas State University — Gallium nitride (GaN) has enormous potential for applications in high electron mobility transistors (HEMTs) used in RF and power devices. Intrinsic device properties such as high electron mobility, high breakdown voltage, very high current density, electron confinement in a narrow channel, and high electron velocity in the 2D electron gas of the HEMT structure are due in part to the wide band gap of this novel semiconductor material system. This presentation discusses the properties of GaN that make it superior to other semiconductor materials, and outlines the research that will be undertaken in a new program at Texas State University to advance GaN HEMT technology. This program’s aim is to further innovate the exceptional performance of GaN through improved material growth processes and epitaxial structure design.

3:54PM E2.00003 Optical Properties of dual ion beam sputtered Indium Tin Oxide films on glass and Silicon , NELSON SIMPSON, WILHELMUS GEERTS, ANUP BANDYOPADHYAY, Department of Physics, Texas State University — Indium Tin Oxide (ITO) is a transparent conducting material that finds application in flat panel displays, solar cells, and photodetectors. High quality ITO films, i.e. films with a large transparency and a high conductivity, are normally deposited above room temperature often at 300-400 C. This high deposition temperature eliminates most plastics as substrates. To lower the substrate deposition temperature we are applying atomic instead of molecular oxygen during the sputtering process. A dual ion beam sputtering system (DIBS) has been modified to allow the substrate to be exposed to an atomic oxygen beam at 45 degrees angle of incidence. Thin films were sputtered as a function of atomic oxygen flux and substrate temperature on glass, silicon, and sapphire substrates. The optical properties were measured by spectroscopic ellipsometry, reflectometry, and FTIR. Film thickness and bandgap were determined from the optical properties in the visible part of the spectrum. Mobility was determined from the infrared part of the spectrum. Optical properties appear to vary with the film thickness, the oxygen flux, and the substrate temperature. Roughness of the samples was independently measured by AFM. This work is supported by a grant from research corporation (10775).

4:06PM E2.00004 Using MuSR to probe internal magnetic field features in the II-IV-V2:Mn DMS , PATRICK MENGYAN, R.L. LICHTI, Texas Tech University, Lubbock, TX 79409-1051, USA, Y.G. CELEBI, Istanbul University, Beyazit, 34459 Istanbul, Turkey, B.B. BAKER, L. HUDY, Texas Tech University, Lubbock, TX 79409-1051, USA, E. CATEK, Istanbul University, Beyazit, 34459 Istanbul, Turkey, K.T. ZAWILSKI, P.G. SCHUNEIMANN, BAE Systems, Advanced Systems and Technology, Nashua, NH 03061-0868, USA — Muon Spin Research/Rotation/Relaxation/Resonance (MuSR) is a technique that utilizes 100% spin polarized muons as a very sensitive probe of a material’s local magnetic and electronic environment. In this contribution, I will give a brief review of the Longitudinal Field Muon Spin Relaxation technique and present preliminary results as applied to investigating local magnetic features in weakly Mn doped ZnGeP2 Chalcopyrite semiconductors. The discovery of room temperature ferromagnetism in some of the II-IV-V2 dilute magnetic systems as well as their conventional semiconducting properties makes these materials prime candidates for prospective use in the field of spin-electronics. The mechanism responsible for connecting the local magnetic features to the bulk magnetic properties is not yet understood. The MuSR technique and the preliminary results presented here are promising first steps in the investigation and attempt to further the understanding of the local magnetic features in these dilute magnetic semiconducting materials.
4:18PM E2.00005 Electrochemical Performance of Lithium Iron Phosphate Doped with Tungsten, HANU ARAVA, Sam Houston State University, LULU ZHANG, Huazhong University of Science and Technology, HUI FANG, GAN LIANG, Sam Houston State University — Due to its high thermal stability, low cost and high theoretical charge capacity, LiFePO4 has emerged as one of the most promising cathode materials for large-scale lithium ion batteries. In this work, we systematically investigated the effect on structure and electrochemical properties brought by W doping on Fe site of LiFePO4. LiFe1-xWxPO4 (x = 0. 0.01, 0.02, 0.03) samples with and without carbon coating were prepared by using solid-state reaction. The phase and structure of as prepared powders were characterized by X-ray diffraction and scanning electron microscopy. Cycling charge and discharge measurement at various C-rates and cyclic voltammetry were employed to reveal the electrochemical properties. Results showed that carbon coating dramatically improved the capacity at fast C-rate. 2 at.% W doping was observed to have the highest charge capacity with 143 mAh/g at 0.1C and a 109 mAh/g for 1C.

4:30PM E2.00006 Photoluminescence Study of Nanodiamond Defects, JOSEPH KIMBALL, T.W. ZERDA, Texas Christian University, Department of Physics and Astronomy, B. ROUT, University of North Texas, Department of Physics, ANASTASIA NEMASHKALO, Texas Christian University, Department of Physics and Astronomy — The unique properties of photoluminescent nanodiamonds make them a preferred candidate for optical labels in biological and medical imaging. To fully implement and understand their optical and physical properties, this study used two different techniques to create in TEM confirmed nanocrystal size range of 5 to 125 nm, the nitrogen vacancy (N-V) defects responsible for the emission of a photostable spectrum from 500-580 nm. The basic theory behind the diamond crystal lattice and point defects responsible for the light emitting nitrogen vacancy (N-V) center are presented. Two different methods, irradiation and high pressure-high temperature (HPTHP), are used to create the sought after (N-V) center. Photoluminescence results correlated with FTIR spectroscopy allowed the determination of the PL intensity relation to various defects, crystal size and nitrogen concentration.

4:42PM E2.00007 Spin Effects in isolated mono- and bilayer molybdenum disulfide Nanowires1, LUCAS FERNANDEZ SEIVANE2, XOCHITL LOPEZ-LOZANO, University of Texas at San Antonio — Inspired by the recent synthesis of needle-like MoS2 nanoparticles, we have investigated the properties of isolated quasi-one dimensional MoS2 nanowires. These nanowires structure a special interest since they constitute one of the smallest self-supported MoS2 systems with promising catalytic properties. A complete description of the nanostructures and spin properties for different sulfur saturations is extremely important for the future developments of novel MoS2-based nanocatalysts. In this work we have performed ab initio simulations within the Density Functional Theory framework with the SIESTA code to study the structural, electronic and spin properties of quasi-one dimensional MoS2 Nanowires. We observed that a change in the number of Mo atoms on the unit cell affects greatly the electronic properties. Interestingly, metallic states are found in all the low-energy models. Also, both for mono- and bilayer the spin states are also localized at the active nanowire edges. We also noticed the presence of a variety of spin regimes suggesting the connection between magnetism and its catalytic properties. In spite of the observed pairing of 5 dimers at the Mo-edge in some cases, we do not observe a Peierls-like metal-insulator transition.

4:54PM E2.00008 Sytematic Study of the Adsorption of Thiol Molecules on Noble-Metal Nanoparticles1, H. BARRON, University of Texas at San Antonio, F. HIDALGO, Universidad Nacional Autonoma de Mexico, L. FERNANDEZ-SEIVANE, University of Texas at San Antonio, C. NOGUEZ, Universidad Nacional Autonoma de Mexico, X. LOPEZ-LOZANO, University of Texas at San Antonio — The study of the interaction between nanoparticles and different types of ligands has been intensively investigated in the last years due to the potential contribution of their properties to the nanotechnology device design. These properties have opened new research fields like plasmonics, with interesting applications in optics, electronics, biophysics, medicine, pharmacology and materials science. Self-assembly monolayers have been thoroughly studied at experimental and theoretical level on extended (111) gold and silver surfaces. However, nanoparticle and molecule properties after the adsorption are still not well understood due to the different factors involved in this process such as the adsorption sites, size and element type of the nanoparticle. In this work we have performed a systematic study of the adsorption of methyl-thiol molecules on Au55 and Ag55 clusters through density functional theory calculations with the SIESTA code. Different adsorption modes of the methyl-thiol molecule on Au55 and Ag55 were considered. In general, for both type of nanoparticles, the methyl-thiol molecule prefers to be adsorbed on the Bridge sites. These results provide valuable information of the structural and electronic properties of methyl-thiol passivated Au and Ag nanoparticles.

5:06PM E2.00009 Composition Dependence of the Properties of Noble-metal Nanoalloys1, LUCAS FERNANDEZ SEIVANE, HECTOR BARRON, JAMES BENSON, University of Texas at San Antonio, HANS-CHRISTIAN WEISSKER, Centre Interdisciplinaire de Nanoscience de Marseille (CINaM-CNRS), XOCHITL LOPEZ-LOZANO, University of Texas at San Antonio — Bimetallic nanostructured materials are of greater interest both from the scientific and technological points of view due to their potential to improve the catalytic properties of novel materials. Their applicability as well as the performance depends critically on their size, shape and composition, either as alloy or core-shell. In this work, the structural, electronic, magnetic and optical properties of bimetallic Au-Ag nanoalloys have been investigated through density-functional-theory-based calculations with the Siesta and Octopus codes. Different symmetries -tetrahedral, bipyramidal, decahedral and icosahedral- of bimetallic nanoparticles of 4-, 5-, 7- and 13-atoms, were taken into account including all the possible different Au:Ag ratio concentrations. In combination with a statistical analysis of the performed calculations and the concepts of the Enthalpy of Mixing and Energy Excess, we have been able to predict the most probable gap and magnetic moment for all the composition stoichiometries. This approach allows us to understand the energy differences due to cluster shape effects, the stoichiometry and segregation. In addition, we can also obtain the bulk energy and surface energy of Au-Ag nanoalloys by looking at fixed number of atoms and fixed morphologies.

This work was supported by NSF PREM Grant DMR-0934218 and DMR-1103730. We thank the Computational Biology Initiative (UTHSCSA/UTSA) and the TACC for providing access and training to the analysis software used.

### Friday, March 23, 2012 3:30PM - 5:18PM

**Session E3 Contributed Oral Presentations: SPS 2**

**Timothy Head, Abilene Christian University**

1This work was supported by NSF Grants DMR-0934218, DMR-0934218. We thank the Computational Biology Initiative (UTHSCSA/UTSA) and the TACC for providing access and training to the analysis software used.
3:30PM E3.00001 Electrochemical fabrication of Porous Silicon for an Investigation for use as the anode in Lithium-ion batteries1, OLIVIA POPNOE, TONI SAUNCY, Angelo State University Physics — An electrochemical cell with a Teflon based structure was made for fabrication of Porous Silicon (p-Si). The cell was then used for anodic etching of a single crystal Si substrate to synthesize a thin layer of p-Si, with hydrofluoric acis used as the electrolytic solution. The resulting film is more robust when compared with those produced previously by non-contact photochemical etching. The anodic etch method results in a relatively uniform distribution of micropores.

1This work is supported by the Angelo State University Undergraduate Research Scholarship.

3:42PM E3.00002 Learning To Use TeX, DEREK HAMMONS, HUNTER CLOSE, Texas State University - San Marcos — TeX is a useful tool for any scientific professional, but it can also be used by undergraduates to create high quality documents for courses. My presentation will focus on why TeX is a useful program for undergraduates to learn. It can create higher quality lab reports and other documents for courses that are commonly used word processors such as Microsoft Word. TeX can be utilized by anyone through use of a TeX document preparation system such as LaTeX and only a few simple commands. Perhaps best of all, TeX is free to download and use! By taking the time to understand how to use TeX, students will learn a valuable skill that will be continue to be useful throughout their academic and professional careers.

3:54PM E3.00003 Angelo State SPS Marsh White Award: Physics After School Special (P.A.S.S.)1, VIKESH DESAI, TONI SAUNCY, Angelo State University Department of Physics, ASU SOCIETY OF PHYSICS STUDENTS TEAM — With a recent Marsh White Award from the SPS National Office, the Angelo State SPS has teamed up with a local YMCA after school program to provide fun lab experiences for the diverse group of K-3rd graders. Several undergraduate presenters are involved, and the funding was used to purchase t-shirts for all participants. The after-school group of approximately 30 children has visited the campus for the first lab session and plans three additional hands-on lab experiences over the course of the semester. For the final visit, the Peer Pressure Team will conduct a full demonstration show and P.A.S.S. Party. The goal of this public engagement is to motivate these young students to learn more about physics with hands-on activities in a fun and safe environment and to establish meaningful mentoring relationships between undergraduate physics majors and younger students.

1This work is supported by a Marsh White Award from the Society of Physics Students National office.

4:06PM E3.00004 Analysis of Lagrange’s original derivation of the Euler-Lagrange Differential Equation, RYAN LAUGHLIN, HUNTER CLOSE, Texas State University - San Marcos — The Euler-Lagrange differential equation provides the Lagrangian equations of motion, and thus allows the exact trajectory of an object in a potential to be found. We analyze the original derivation of the Euler-Lagrange differential equation via a translation of the third edition of Lagrange’s Mécanique Analytique (1811). We compare and contrast this derivation with the derivation commonly done in a junior-level classical mechanics course. Lagrange uses several founding concepts to produce a generalized equation of motion for all dynamics. These concepts are, in the order addressed by Lagrange, the Principle of Virtual Velocities, the Conservation des Forces Vives, and the Principle of Least Action. Lagrange then employs what he calls the Method of Variations to the general equation of motion for dynamics to ultimately resolve something similar to the Euler-Lagrange Differential equation we use today. We also compare modern notation with Lagrange’s notation.

4:18PM E3.00005 Mapping atomic arrays in crystals by interpreting electron diffraction patterns, BRYAN NEAL, NICK LANNING, WILLIAM WARE, SPENCER WIGGINTON, CHRIS LEE, CRISTIAN BAHRIM, Department of Physics, Lamar University, Beaumont, TX — Analyzing diffraction of light and electrons allows one to map the geometric structure of nettings and crystals. There is a strong analogy between light and electron diffraction because in both cases the diffraction angles are small and the patterns may be described as images of a Fourier transform. Light diffraction patterns may be interpreted as the optical transforms of 2D-nettings and therefore are simpler to understand. The interpretation of electron diffraction patterns is more sophisticated and requires the visualization of the crystal’s reciprocal lattice using vector algebra. With light we can analyze the redistribution of energy in diffraction patterns. Our studies indicate a deviation of about 1% from the exact conservation of energy when the ratio between slit width and slit separation approaches 1. Such a deviation is expected to show up in electron diffraction patterns produced by super dense materials. We focused our studies on electron diffraction by graphite for understanding the mechanism of electron transmission through Carbon atoms. From measuring diffraction patterns and applying the Heisenberg Uncertainty Principle, we are able to estimate the atomic transmission time of the projectile electron and the group velocity of the electron passing through the crystal. Finally, our analysis leads to the estimation of the C-C bond in a hexagonal closed-packed (hcp) graphite crystal and the volume of the Carbon atom which diffracts the projectile electron. Sponsored by the STAIRSTEP-NSF-DUE grant# 0757057.

4:30PM E3.00006 Characterization of Energetic Properties nano-particle Silicon1, BLAKE MCCRACKEN, TONI SAUNCY, Angelo State University Department of Physics — Porous silicon has been reported to have an unusual property of highly energetic reactions when subjected to oxidizers and nitrates. Characterization of such energetic properties has been done using a variety of methods, many of which are well beyond the cost allowance for undergraduate level research. In this work, we explore a low cost method using inexpensive piezoelectric sensors and standard storage oscilloscopes. The voltage pulses from the sensors provide time dependent signals that can be used in the characterization of the propagation velocity of these energetic reactions in porous silicon particles, with the ultimate goal of discerning more about the nature of the energy produced upon detonation.

1This work is supported by the Angelo State University Undergraduate Research Scholarship.

4:42PM E3.00007 What Happened to Climate Change?, WILLIAM LYNN, Abilene Christian University — Recent data concerning solar irradiance, the amount of power produced by the sun that reaches the top of each square meter of Earth’s atmosphere, has led to a greater understanding of how variations of solar activity affect Earth’s global temperature. Results from the NASA Solar Radiation and Climate Experiment (SORCE) show that the sun is undergoing a prolonged solar minimum which researchers believe to be a factor in decreased global temperatures in 2011. Along with these results, which show a measured irradiance lower than previous measurements indicated, the ongoing La Niña is a significant factor in the decrease in global surface temperatures. This presentation will focus on a review of current articles and research on the impact of solar cycles as well as other factors contributing to models of global climate change.
4:54PM E3.00008 Construction of a Single Beam Optical Trap with a Modified Design for Undergraduate Labs. We have constructed an apparatus known as an optical tweezers using off the shelf, fairly inexpensive components. These include a 20 mw HeNe laser, a standard student lab optical microscope, and an inexpensive CCD firewire camera. The trap is designed to work with polystyrene spheres of various diameters, but to be robust enough for more advanced research. The goal of the work is to use the device for undergraduate research projects but also for use in the advanced labs at Angelo State University. Trapping is achieved in the device by focusing the collimated laser beam using a 100x oil immersion objective on the microscope. At the position of the beam waist, the light produces gradient forces that trap the micron-sized spheres. Images are collected and processed using LabVIEW software and measurement of particle size is accomplished through software tools for use with unknown-sized samples. Currently, imaging tests are being performed to improve the focus of the camera on the trapping region. It is expected that successful trapping of the polystyrene spheres will soon be accomplished. Once that is established then we will trap birefringent particles such as quartz or calcite. Birefringent particles should exhibit rotational motion when trapped.

1This work was supported by the Angelo State University Undergraduate Research Scholarship.

5:06PM E3.00009 Using Satellite Data to Monitor Global Climate Change. Accurate measurement of the ice melt in Greenland is very important in monitoring global climate change. Observations indicate that average global temperature has been increasing for the past 30 years, which should cause significant melting from the ice sheets of Greenland and Antarctica. There has been some controversy over whether the ice mass is increasing or decreasing. In an effort to determine a solution to this controversy, the twin satellites of the Gravity Recovery and Climate Experiment (GRACE) have made detailed measurements of the earth's gravitational field. They have confirmed that while the thickness of the ice in the center of Greenland remains approximately constant, the edges of the ice sheets are melting rapidly. Not only are the ice sheets shrinking, but the rate at which they are shrinking is accelerating. These measurements are in agreement with global climate models. This presentation will focus on the operation of the GRACE system, the effects of the shrinking ice sheets, and the relevance of the experiment to global climate change.

Friday, March 23, 2012 7:00PM - 8:45PM —
Session F1 Banquet Houston Harte University Center UC 100 -
7:00PM F1.00001 Dinner —
8:00PM F1.00002 A Funny Thing Happened on the Way to Pair-a-Dice: One Geologist’s Curious Journey from Fieldwork into Fiction. SUSAN CUMMINS MILLER, University of Arizona

Saturday, March 24, 2012 8:30AM - 9:42AM —
Session G1 Plenary Session II Houston Harte University Center UC 100 - David Bixler, Angelo State University

8:30AM G1.00001 Growing Undergraduate Physics Programs: What SPIN-UP Tells Us Works. ROBERT HILBORN, American Association of Physics Teachers — In the early 2000s, the National Task Force on Undergraduate Physics, with funding from the ExxonMobil Foundation, visited 21 thriving undergraduate physics programs to understand why those programs were growing while most physics programs had experienced a substantial decline in the number of undergraduate majors in the 1990s. The ensuing SPIN-UP Report provided guidance to physics departments that sought to enhance their programs. With recent funding from the National Science Foundation, the American Association of Physics Teachers has been hosting SPIN-UP Regional Workshops to work with physics departments to develop strategic plans to grow their programs. This talk will give an overview of the SPIN-UP report and the experiences of the more than 70 physics departments that have participated in the regional workshops.

9:06AM G1.00002 Physics Careers: To the Bachelor’s Degree and Beyond. CRYSTAL BAILEY, American Physical Society — In our current era, society needs an increased representation of physicists in the workforce to help solve the growing number of societal and environment problems we collectively face. And even though a physics bachelor’s degree opens the door to an incredible diversity of high-paying and rewarding careers, most undergraduates are only aware of academic career paths (having mostly encountered only physics professors during their lifetime). This talk will provide in-depth information about physics career paths outside of academia which available to those with a bachelor’s degree in physics, and will discuss how these options change as one moves through an advanced degree in physics. The talk will include real-life examples of working physicists at all stages of the degree path, and salary and employment sector statistics for physics bachelors, masters, and PhD recipients. The talk will also include information on additional careers and professional development resources for students.

Saturday, March 24, 2012 10:30AM - 11:54AM —
Session H1 Contributed Oral Presentations: APS 5 Houston Harte University Center UC 203 - Michael Daugherity, Abilene Christian University

10:30AM H1.00001 Behavior of Viscous Potential during Purely Northward Interplanetary Magnetic Field. SHREE BHATTARAI, RAMON LOPEZ, Univ. of Texas at Arlington — The solar wind, on passing around the Earth’s magnetosphere, drags along with it the plasma inside the magnetosphere due to the formation of Kelvin-Helmholtz waves. This dragging of the magnetospheric plasma close to the magnetopause along the flanks is followed by a return flow inside the magnetosphere, thus creating a circulation pattern. This viscous cycle gets mapped down to the ionosphere, thus imposing an electric field on Earth’s ionosphere. The value of the electric potential generated due to the electric field produced by the viscous cycle is called the viscous potential. It was assumed that the viscous potential was independent of IMF orientation but, in this paper, we show that the viscous potential is a function of IMF Bz for northward IMF.
Charles Allen, Angelo State University

is minimized. They exhibit a butterfly effect, deterministic chaos, and attractors with potential wells and levels. They have extraordinary self-organizing properties. They form a fractal hierarchy of structures when a recently discovered universal functional

Critical for this research is a full understanding of causets’ intrinsic properties. A general self-consistent theory of causets where only their

time, volume, geometry, and matter, are intrinsic properties of the causet; and (4) particles arise as self-organized structures (arXiv: 1112.1064).

structured as a causet of events; (2) the transition from continuous to discrete spacetime is a real quantization; (3) all other quantities, such as

nucleons hadrons exchange was considered. The comparison of those values will be discussed.

Pakistan — The cross section of Bc meson absorption by nucleons are calculated in meson-baryon exchange model using hadronic lagrangian

using statistical inference from maximum entropy, DAVID KNOBLES, STEVEN STOTTS, JASON SAGERS,

underwater acoustics it is a traveling wave in a strongly inhomogeneous bounded medium. Further, the physics of the acoustic modes in cosmology is that of a standing wave with simple initial conditions, whereas for spatial and temporal variability sufficiently well, which leads to model error dominating the statistical inference problem. This is not the case in shallow ocean environments generally has large temporal and spatial inhomogeneities, whereas the early universe was a nearly homogeneous cosmological soup with small but important fluctuations. Acoustic propagation models used in shallow water acoustics generally do not capture spatial and temporal variability sufficiently well, which leads to model error dominating the statistical inference problem. This is not the case in cosmology. Further, the physics of the acoustic modes in cosmology is that of a standing wave with simple initial conditions, whereas for underwater acoustics it is a traveling wave in a strongly inhomogeneous bounded medium.

Saturday, March 24, 2012 10:30AM - 11:54AM —

Session H2 Contributed Oral Presentations: APS 6 Houston Harte University Center UC 201 - Charles Allen, Angelo State University

10:30AM H2.00001 Influence of b - flavored hadron exchange on Bc absorption by nucleons , SONAINA UNDLIEEB, M.A.K. LODHII, Texas Tech University Lubbock TX, FAISAL AKRAM, University of Punjab Lahore Pakistan — The cross section of Bc meson absorption by nucleons are calculated in meson-baryon exchange model using hadronic lagrangian based on SU(4)/SU(5) flavor symmetries. In these calculations the b-flavored hadrons are exchanged, which were ignored in the previous calculations. The new calculated values of cross sections are found significantly different from the previously obtained, when only c-flavored hadrons exchange was considered. The comparison of those values will be discussed.
10:42AM H2.00002 Comparison of Neutrino DIS Structure Functions Using the Nuclear NCTEQ PDFs . BENJAMIN CLARK, FRED OLNESS, SMU — Deep inelastic scattering (DIS) of leptons off protons has been used extensively to constrain standard model (SM) parameters and determine the nucleon structure functions. Neutrinos are a unique probe for DIS as they put the tightest constraints on the strange quark distribution within the proton. Heavy nuclear targets are essential for neutrino-induced DIS due to the neutrino’s small cross-section. Nuclear parton distribution functions (NPDFS) contain significant nuclear corrections to the free proton PDFs and are essential for accurate predictions of SM cross-sections in current-generation neutrino experiments like Minerva and Minos. Experimentally measured structure functions and NPDFS from the neutrino DIS experiments are compared to the NCTEQ NPDFS to learn about both the strange quark distribution and the corresponding nuclear correction factors.

10:54AM H2.00003 Coulomb distortion and medium corrections in breakup reactions1 , MESUT KARAKOC, Texas A&M University-Commerce, ADRIANA BANU, James Madison University, CARLOS BERTULANI, Texas A&M University-Commerce, LIVIUS TRACHE, Texas A&M University — We study the effect of final state interactions and of medium modifications of the nucleon-nucleon (NN) cross sections on the nucleon knockout reactions. We compare the results obtained with and without these effects to check their relevance in the extraction of spectroscopic factors. Our results are compared to published experimental data for total nucleon-removal cross sections and for momentum distribution of fragments. It is shown that final state interactions (mainly Coulomb distortion) and medium effects leads to some relevant modifications of quantities extracted.

11:06AM H2.00004 Reconstructing Drell-Yan Data at SeaQuest1 , TYLER HAGUE, Abilene Christian University and Argonne National Laboratory, SEAQUEST COLLABORATION — SeaQuest is a fixed target experiment at Fermi National Accelerator Laboratory. Using the 120-GeV main injector, SeaQuest will study the nucleon sea through proton-proton and proton-deuterium Drell-Yan reactions. The Drell-Yan process occurs when a quark and an antiquark annihilate into a virtual photon that then decays into a lepton pair. From these Drell-Yan cross sections, the ratio of the d-bar to the u-bar quark distributions can be extracted. From measurements on several nuclear targets, the energy loss of fast quarks in the nucleus can be deduced. The MySQL database for SeaQuest and a new approach utilizing database commands for track reconstruction will be described. Reconstruction occurs within the database using dynamically created queries to create temporary tables. These are used to construct partial tracks at each station that can be combined into full tracks. Typically the wire chambers at each station will be used for tracking and the hodoscopes will be used for the trigger. In addition, track reconstruction with only hodoscopes is being developed for monitoring hodoscope efficiencies.

1This work was supported in part by U.S. Department of Energy, Office of Nuclear Physics, under contract No. DE-AC02-06CH11357.

11:18AM H2.00005 A Search for Additional Evidence for a Recent Nearby Supernova , MERRIT MALLORY, JAMES BALL, Retired — Motivated by the finding of possible recent (2.1 – 2.8 ma) supernova (SN) remnants on the surface of the moon in the form of $^{60}$Fe, we have examined published data of the Apollo rock and soil core samples for additional evidence. Our main criterion has been to compare the ratio between$^{60}$Co (the daughter of $^{60}$Fe) activity and possible$^{26}$Al excess activity. This ratio of the gamma ray activity for these isotopes (15% at SN creation) has been detected in satellite data and predicted by supernova elemental abundance calculations. Of the data examined for 7 cores, three of these show suggestive possibilities of an excess of $^{26}$Al at a depth in the core consistent with an age of 2 to 3 ma. While these results are complicated by low expected counting rates, as well as the known presence of gardening effects and concerns about additional mixing during the sampling and subsequent handling, they suggest the desirability of a more thorough radiological reexamination of these samples for the presence of $^{60}$Co decay and if sample material exist, AMS could be used to search for live $^{60}$Fe.

11:30AM H2.00006 The new method to send energy , PHILIP SHIN, None — I feel the electricity as radar. We can send the energy from antenna to another antenna, and it is moving easy and better than an electrical wire and safe. As a result, the transistor radio is more accurate and move stronger than the digital radio by the fact that electricity flows as a substance. To explain how the energy flows, the trees do not move by itself to hurt man (it is to be ). So the energy flow from antenna to another antenna safely and possibly without hurt as a sword. I understand that energy, the electricity is existing as radar and it proves the fact that how it flows from one place to another.

11:42AM H2.00007 The difference between animal and plant (single)1 , PHILIP SHIN2. None — The plants have the cell walls, but the animal cells have not. This means the animals eat the other cells, but the plants make the cells by making the carbons into the oxygen. So the animals cells are the sword that kill the other cells. So the animal cells are together, but the cell walls mean they are making the same kinds from nothing to something. So plants’ cells are the feeling that includes the sword of animals’ cells. The feeling is from nothing. And this means the single is better than the dualism, as it has the arrow from the origin and this has the start and the end. So the animal and the plant are different from each other.

1Single is better than the dualism
2The basic reason why the single is better than the dualism. As the animal and the plant are different.

Saturday, March 24, 2012 10:30AM - 12:06PM – Session H3 Contributed Oral Presentations: AAPT 2 Houston Harte University Center UC 211 - Heather Galloway, Texas State University

10:30AM H3.00001 Student Understanding and Application of the Dirac Delta Function . DAVID DONNELLY, HUNTER CLOSE, Texas State University-San Marcos — We will present the analysis of student responses to a survey designed to test their understanding of and ability to use the Dirac delta function to solve problems in an upper division electrodynamics course. Students were asked to solve three different problems involving the Delta function, and to articulate the reasoning they were using to solve the problem. Results indicate that: 1. students view two-dimensional and three-dimensional problems as independent concepts rather than one being a special case of the other. 2. Students understand the Dirac delta function as acting as a “localization operator”, but are not able to employ the delta function in a mathematically formal way. 3. Students view the Dirac delta function as similar to the Kronecker delta. Namely that it is a piecewise continuous function.
10:42AM H3.00002 An Introduction to the WeBWork Online Homework System for Introductory Physics Courses, DOUGLAS YOUNG, Permian High School, Odessa TX — The use of online homework systems, such as WebAssign or the University of Texas’ Quest Learning, as part of an introductory physics course has become popular among physics teachers. In some situations, such as teaching physics in high school, access to these services is not possible. WeBWork is an open-source online homework system maintained by the Mathematical Association of America and funded by the National Science Foundation. WeBWork has a small library of physics problems. In this paper, I will provide an introduction to how WeBWork could be used as part of an introductory physics course.

10:54AM H3.00003 Compton scattering with low intensity radioactive sources, CARROLL QUARLES, Texas Christian University — Compton scattering experiments with gamma rays typically require a “hot” source (~5mCi of Cs137) to observe the scattering as a function of angle. (See Ortec AN34 Experiment #10 Compton Scattering) Here a way is described to investigate Compton scattering with micro Curie level radioactive sources that are more commonly available in the undergraduate laboratory. A vertical-looking 2 inch coaxial hpGe detector, collimated with a 2 inch thick lead shield, was used. Cylindrical Al targets of various thicknesses were placed over the collimator and several available sources were placed around the target so that the average Compton scattering angle into the collimator was 90 deg. A peak could be observed at the expected energy for 90 deg. Compton scattering by doing 24 hour target-in minus target-out runs. The peak was broadened by the spread in the scattering angle due to the variation in the angle of the incoming gamma ray and the angular acceptance of the collimator. A rough analysis can be done by modeling the angular spread due to the geometry and correcting for the gamma ray absorption from the target center. Various target materials and sources can be used and some variation in average Compton scattering angle can be obtained by adjusting the geometry of the source and target.

11:06AM H3.00004 Jell-O Optics: Edibly Exploring Snell’s Law and Optical Power†, JENNIFER HENDRYX, University of Arizona, MATHIAS REYNOLDS, Mountain View High School — This presentation details a laboratory exercise and/or demonstration of refraction with an inexpensive, simple set-up: a pan of Jell-O, protractors, and laser pointers. This activity is presented from the perspective of an optical sciences graduate student who has spent the school year team-teaching high school math and physics (through Academic Decathlon). The goal is to present some of the fundamentals of optics with an enjoyable and affordable approach. The concepts include Snell’s law, index of refraction, and optical power/focal length as they relate to the curvature of a lens.

†Funded through NSF G-TEAMS

11:18AM H3.00005 Physics Education Technology (PhET) Virtual Lab Activities for Distance Learning Courses, THOMAS CALLAWAY, Stephen F. Austin State University — The Physics Education Technology (PhET) simulations offer a great set of tools to present simulations of physics phenomena in the classroom. This presentation describes the use of PhET to develop virtual lab assignments that supplement hands-on lab activities for a distance learning class in conceptual physics.

11:30AM H3.00006 Using peer review process for teaching introductory physics laboratory, TIKHON BYKOV, McMurry University — In recent years various peer instruction methods have been widely used and proven to be successful for teaching of introductory physics courses. Most of these methods refer to student interactions in small peer groups during lectures and/or discussion sessions. At the same time peer review process has been a standard part of any scientific enterprise and/or scientific publication process for more than a century. We have incorporated a method very similar to professional peer review into teaching of introductory physics laboratory. In this process students are asked to review anonymous copies of each other’s lab reports and determine whether or not these reports are suitable for publication in a scientific journal. This technique has become an essential part of the Modular Curriculum Approach (MCA) teaching model designed and adopted at McMurry University. MCA has demonstrated significant gains in student learning.

11:42AM H3.00007 Physics Learning Styles in Higher Education, REBECCA LOOS, JAMES WARD, None — Students in Physics learn in a variety of ways depending on backgrounds and interests. This study proposes to evaluate how students in Physics learn using Howard Gardner’s Theory of Multiple Intelligences. Physics utilizes numbers, conceptualization of models, observations and visualization skills, and the ability to understand and reflect on specific information. The main objective is to evaluate how Physics students learn specifically using spatial, visual and sequential approaches. This will be assessed by conducting a learning style survey provided by North Carolina State University (NCSU). The survey is completed online by the student after which the results are sent to NCSU. Students will print out the completed survey for further analysis. The NCSU results categorize students within five of ten learning styles. After the evaluation of Howard Gardner’s Theory of Multiple Intelligences and the NCSU definitions of the ten learning styles, the NCSU sensing and visual learning styles will be defined as the Gardner’s spatial, visual learning styles. NCSU’s sequential learning style will be looked at separately. With the survey results, it can be determined if Physics students fall within the hypothesized learning styles.

11:54AM H3.00008 Insight to Student Reasoning Through Use of Question Format†, MARK ELLERMANN, BETH THACKER, Texas Tech University — We study the effects of problem format on physics students’ incorrect answers on quiz questions. We analyzed students’ incorrect answers by a rubric. The three problem formats analyzed were: multiple choice, calculation, and ranking. This builds on previous research where the effect of problem format on students’ answers was analyzed. The answers were analyzed according to answer choice and explanation wording.

†This project is supported by the NIH grant 5RC1GM090897-02.