2008 Joint Spring Meeting of the Texas Sections of APS, AAPT, and Zone 13 of SPS
Corpus Christi, Texas
http://www.aps.org/meetings/meeting.cfm?name=TSS08
The fabric of our dimension. Equation my groundbreaking development of the relationship of light and gravity that incorporates a precise insight of how perception and consciousness are involved in Padre A will do some make-and-takes. Limited to 20 participants. experience share their personal experiences, organizational tips, best teaching strategies, and favorite hands-on activities. There really are ways to do things — We have learned a lot about how to not only survive teaching Physics, but how to enjoy each day. 3 teachers with over 60 combined years of teaching Corpus Christi Hotel Marina Tower Padre C are investigated for Nd$^{3+}$, ROBERT C. DENNIS, KELLY L. NASH, JOHN B. GRUBER, DHIRAJ K. SARDAR, UTSA — Spectroscopic properties of Nd$^{3+}$ nanocrystals have been analyzed using the Judd-Ofelt (J-O) approach in order to obtain the phenomenological intensity parameters. The J-O intensity parameters suggest that synthesized Nd$^{3+}$ nanocrystals have been analyzed using the Judd-Ofelt (J-O) approach in order to obtain the phenomenological intensity parameters. The J-O intensity parameters of Nd$^{3+}$ nanocrystals for photonic applications, in particularly biosensors, when used in the near infrared (0.8 $\lambda$ region. *This research was supported in part by the National Science Foundation Grant No. DMR-0602649 and the NSF-sponsored CBST at UC Davis under the cooperative agreement No. PHY-0120999.
This is a continuation of a NSF-funded research in MEMS at Texas Tech.
**10:06AM APS2.00004 Effects of Solar Wind Density on Geo-effectiveness of Storms**

ELIZABETH MITCHELL, RAMON LOPEZ, UT Arlington — Geomagnetic storms are produced by solar wind disturbances causing large currents to flow throughout the magnetosphere. One current system observed to form during geomagnetic storms is the Ring Current. The rate of ring current injection is used to measure the geo-effectiveness of the solar wind electric field. Examining the relationship between the solar wind electric field and the ring current injection rate, we have found a dependence on the Alfvén Mach number during periods when the solar wind electric field has a non-linear relationship with the transpolar cap potential. During these periods, known as saturation, an increase in the Alfvén Mach number relates to a greater ring current injection rate for the same amount of solar wind electric field. Since the Alfvén Mach number depends on the solar wind density, this effect indicates that the geo-effectiveness of the solar wind electric field depends on the solar wind density as well as its electric field when the transpolar cap potential is saturated.

1This material is based upon work supported by CISM, which is funded by the STC Program of the National Science Foundation under Agreement Number ATM-0120950.

**11:18AM APS2.00005 Laser Driven Radiative Shocks in High Energy Density**

C. MANKA, R. LUNSFORD, S. NIKITIN, RSI, Lanham, MD, M. LAMING, D. ZABATAKIS, J. GRUN, NRL, Washington, DC — The long time over which oscillations associated with radiative shocks within the interstellar medium occur makes clear observation of these instabilities highly problematic. A velocity dependent cooling instability is thought to cause fluctuations in the propagation velocity of such shocks. An experiment at NRL investigates and perhaps validates the applicability of present analytic models to various multidimensional radiative shock instabilities. The PHAROS laser at NRL is used to create the relevant shock front by ablative acceleration of an aluminized Mylar foil that covers a small gas filled tunnel in a PMMA block. As this shock propagates along the tunnel, a secondary shock is launched into the walls of the tunnel and the progress of this shock into the PMMA block preserves a continuous record of the primary shock’s velocity as it travels the length of the tunnel. The density gradient associated with the shock in the PMMA is recorded using dark field shadowgraphy on a SIM-8 multi-channel high speed framing camera. The tunnel shock velocity is determined from the shape of the shock launched into the PMMA block for any time prior to the instant at which the image frame was taken, providing documentation of any oscillations in the velocity of the shock.

1supported by a grant from NASA.

**11:30AM APS2.00006 Ionospheric Skill Scores in TING**

JORGE LANDIVAR, UT Arlington, ALAN BURNS, National Center for Atmospheric Research, High Altitude Observatory, RAMON LOPEZ, UT Arlington — This presentation examines two ionospheric models, Thermosphere-Ionosphere Nested Grid (TING) and International Reference Ionosphere (IRI), and compares them to each other and to ionosonde data from the SPIDR database for the time period of July 1995 from the 4th through the 16th, by calculating standard skill scores. This presentation is a follow-up to a previous Texas APS meeting presentation.

1This material is based upon work supported by CISM, which is funded by the STC Program of the National Science Foundation under Agreement Number ATM-0120950, and by NSF grant GEO-0607195.

Friday, March 7, 2008 10:30AM - 12:06PM – Session SPS1 High School and Undergraduate Student Research I

Omni Corpus Christi Hotel Marina Tower Padre B

**10:30AM SPS1.00001 Using SPS at the Community College Level to Develop a Science Road Show to Present to K-12 Schools**

JESS T. Dowdy1, Northeast Texas Community College — The development of a science road show at the community college level will be addressed following the model implemented at Northeast Texas Community College. The use of the local SPS chapter in performing the show will be addressed along with guidelines for developing grant support.

1AAPT Member

**10:42AM SPS1.00002 Forces and the Potential Energy Function for a Bow-and-Arrow System**

KEN TAYLOR2, BLAINE COUTANT2, TATUM CROW4, AUSTIN JAMES4, Lake Highlands High School — The experiments described here consist of a series of investigations into the dynamics of a bow as it is bent (and released) under the influence of a stretched string. The bow is “student-friendly” and has no pulleys for facilitating stretch. The presentation will discuss the various approaches to characterizing the bow, the string, and its energy efficiency.

1Physics Teacher
2AP Physics-C Student
3AP Physics-C Student
4AP Physics-C Student

**10:54AM SPS1.00003 How to Use a Bed of Nails to Facilitate Excitement during a Science Road Show Presentation at Local Schools**

FABIAN PENA, SHAWN KRIDLER, PETE BERGER, Northeast Texas Community College — The authors will demonstrate how to use a bed of nails to pump up the students at local K-12 schools. The use during Science Road Show presentations will be addressed along with suggestions on how to build the drama and introduce humor and learning.
11:06AM SPS1.00004 How much sun does sunblock block?  , JENNIFER HENDRHYX — Sunscreens vary by strength, brand, and active ingredients. Consumers want to know which product is most effective. Using a spectrometer, I am able to observe the behavior of UV rays when they encounter the sunscreen. The UV is expected to be absorbed or reflected at different amounts, depending on the active ingredients of the sunscreen. What is the cause of the variations? More importantly, how can these variations be measured? The objective of this experiment is to answer these questions with limited time and resources. I will take several spectra of transmitted and reflected UV rays and compare between samples how much of the UV is actually blocked. I hope to analyze several variable factors that may (or may not) change the effectiveness of sunblock.

11:18AM SPS1.00005 Synthesis of porous silicon on a p-type substrate using a non-contact method  , KRISTIN PETERSON, TONI SAUNCY, Angelo State University, TIM DALLAS, Texas Tech U. Electrical Engineering, MARK GRIMSON, Texas Texas U. - Biological Science — We have previously reported on the synthesis of porous silicon (p-Si) on n-type crystalline silicon (c-Si) substrates by using a light-induced hydrofluoric acid (HF) synthesis technique. Now, we will discuss details of recently synthesized p-Si on p-type (Boron doped) c-Si substrates. Both types were treated using the expanded beam of a He-Ne laser to produce a localized electric field on the bulk c-Si wafer while the samples were immersed in hydro-fluoric acid for varying amounts of time. Interestingly, the two sample types are completely different in their formation of the p-Si thin film. The n-type sample displays thin film in the region where the laser is incident on the surface. The p-Si thin film on the p-type samples form on both sides of the sample, but only in regions not illuminated by the laser beam. SEM micrographs of the samples were analyzed to compare differences in surface features.

1This work supported by NSF#0648761 - Division of Engineering Education.

11:30AM SPS1.00006 Fluid Resistance Studies with an Atwood Machine  , KEN TAYLOR1, OMAR ARAGON2, RUSSELL BRAUN1, ELLIAS FESSAHAE1, Lake Highlands High School — An Atwood machine in which one of its masses moves through water is used to study fluid resistance. In particular, efforts are made to compare the effects of the water resistance for objects of similar geometry but different densities. The presentation describes the apparatus, the computer system used for data acquisition and the various schemes used in the investigation.

1Physics Teacher  
2AP Physics-C Student  
3AP Physics-C Student  
4AP Physics-C Student

11:42AM SPS1.00007 Stripes or Bubbles in the N=2 Landau Level: A DMRG Study  , CANDICE WITHROW, BARRY FRIEDMAN, LAUREN ROD, Department of Physics, Sam Houston State University — Using the density matrix renormalization group (dmrg), we have reexamined the phase diagram of the N=2 Landau level. In previous dmrg calculations we attained results highly agreeable to those of Shibata and Yoshioka at filling factor 18/42, by using 200 states in the blocks. The goal of our study is to determine whether the ground state is an anisotropic crystal near half filling, as suggested by some mean field approaches, or a stripe state, as suggested by other mean field approaches and prior dmrg results. Such dmrg calculations, i.e. Shibata and Yoshioka, have placed the phase diagram between stripes and bubbles at a filling factor slightly less then .4 by looking at the projected pair correlation function at the special lines x=0 and y=0. We reexamine this boundary by studying the Fourier transform of the projected pair correlation.

11:54AM SPS1.00008 Temperature dependence of photoluminescence from a strained InGaAs/GaAs quantum well  , MEAGAN SALDUA, TONI SAUNCY, Angelo State University — The goal of this project is to develop a model which best explains the temperature dependence of the photoluminescence (PL) emission from a single InGaAs quantum well. Due to lattice mismatch between the InGaAs and the GaAs substrates, the quantum well active region is under an approximately 1.3% compressive strain. The strain in the layer causes the temperature dependence of the photoluminescence to be complicated and unexplainable by standard bulk material relationships. Experimental measurements rule out the standard Varshni relationship for the PL temperature dependence, the most commonly used empirical equation. We will discuss luminescence data and initial model development.

Friday, March 7, 2008 2:00PM - 4:00PM –  
Session W2 AAPT Workshop II: Introducing the TI-Nspire CAS Learning Technology  Omni Corpus Christi Hotel Marina Tower Padre C

2:00PM W2.00001 Introducing the TI-Nspire CAS Learning Technology  , MICHAEL ONSBOURNE, Texas Instruments — Engage your students! In this hands-on workshop, we will demonstrate how TI’s newest graphing technology can be integrated into the physics classroom. Come experience both the TI-NspireCAS Handheld and the TI-NspireCAS Computer Software. The new TI-Nspire learning technology has been developed to allow students to explore physics and to better understand concepts through the manipulation of complex formulas, graphing, spreadsheets, data analysis, and simulations. During the workshop you will receive an overview of the technology, sample activities, along with the opportunity to experience how TI-Nspire CAS can be effectively integrated into the physics classroom. Limited to 20 participants.

Friday, March 7, 2008 2:00PM - 3:24PM –  
Session SPS2 High School and Undergraduate Student Research II  Omni Corpus Christi Hotel Marina Tower Riviera I

2:00PM SPS2.00001 A Single Mother’s Perspective of How High School Students Respond to her Interaction with the Science Road Show at Northeast Texas Community College  , ASHLEY HANSON, Northeast Texas Community College — The use of SPS student participation during a science road show at local schools will be addressed. Specifically the author will address how she shared her story during a science road show and how her story relates to high school students staying focused on science, math, and school in general.
The Phoenix detector is located at Brookhaven National Laboratory on the Relativistic Heavy Ion Collider (RHIC) ring where it studies both heavy ion and polarized proton-proton collisions. One of the primary goals of the polarized proton program is to improve our understanding of the proton’s spin structure. A level 1 trigger upgrade is currently being constructed for PHENIX. This will involve the installation of Resistive Plate Chambers (RPCs). These new chambers will improve our ability to trigger on high transverse single muons that are produced in the decay of W bosons. Before these new chambers can be installed they must pass a series of quality control tests. These simple but effective tests will be performed on internal components of the RPCs before the individual modules are assembled. These tests will yield a pass or fail result for each gas gap. All gaps that pass these tests can then be used in the construction of the RPC modules. A brief introduction to the physics and construction of RPCs, current quality procedures and tests, and current status of the RPC tent will be presented.

2:12PM SPS2.00002 Quality Analysis and Control Procedures for the PHENIX RPC Forward Trigger Upgrade, DILLON THOMAS, Abilene Christian University, PHENIX COLLABORATION — The PHENIX detector is located at Brookhaven National Laboratory on the Relativistic Heavy Ion Collider (RHIC) ring where it studies both heavy ion and polarized proton-proton collisions. One of the primary goals of the polarized proton program is to improve our understanding of the proton’s spin structure. A level 1 trigger upgrade is currently being constructed for PHENIX. This will involve the installation of Resistive Plate Chambers (RPCs). These new chambers will improve our ability to trigger on high transverse single muons that are produced in the decay of W bosons. Before these new chambers can be installed they must pass a series of quality control tests. These simple but effective tests will be performed on internal components of the RPCs before the individual modules are assembled. These tests will yield a pass or fail result for each gas gap. All gaps that pass these tests can then be used in the construction of the RPC modules. A brief introduction to the physics and construction of RPCs, current quality procedures and tests, and current status of the RPC tent will be presented.

2:24PM SPS2.00003 Vibrational Modes on a PASCO Track, KEN TAYLOR1, Lake Highlands High School, GEOFF DUNHAM2, AUSTIN LEVINTON3, CAMERON TYLER-VANN4, Lake Highlands High School — Several experiments with carts on a track in which various modes of vibration are possible are described. Systems consisting of one, two and three masses (and springs) are studied. The investigations include representative samples of resonance curves. The driving force is supplied by a PASCO harmonic oscillator/driver.

3:36PM SPS2.00004 Effect of Magnetic Dipole Moment on Magnet Forces, KEN TAYLOR1, Lake Highlands High School, IAN CAMPBELL2, MATTHEW MIROCHNA3, ROBBIE STEWART4, Lake Highlands High School — This paper discusses the effect of magnetic dipole moment on the “lifting power” of permanent magnets and on forces between magnets. To within the precision of observations, stacking identical magnets end-to-end appears to increase the dipole moment of a magnet in direct proportion to the material length of the magnet. This convenience facilitates a wide range of experiments that can be performed with magnets to study their fields and forces.

2:48PM SPS2.00005 A Meter Stick Torsion Oscillator, KEN TAYLOR1, CHRIS ATIENO2, SHANNON O’BRIEN3, BEN STEWART4, Lake Highlands High School — This paper discusses a simple experiment in which torsion oscillations are set up in a pivoted meter stick that is balanced by a weight on one side of the axis of rotation and a stretched spring on the other side. By varying the torques applied to the mass-meter-stick-spring system, a non-conventional torsion oscillator can be studied and an expression for the effective torsion constant derived from application of Newton’s second law. A rotary motion sensor serves as the axis about which the oscillating rotations occur.

3:00PM SPS2.00006 The Mystery of the Missing Baryons, JOSEPH KISH, Abilene Christian University, MAIN INJECTOR PARTICLE PRODUCTION EXPERIMENT (MIPP) COLLABORATION — In quark models the number of baryon excited states predicted depends only on the number of degrees of freedom. Simplified quark-diquark models describe all the observed resonance states considerably well. However, standard 3-quark models have additional degrees of freedom that predict a greater number of excited states than have been observed. In order to solve the mystery of the “missing baryons”, gain a better understanding of nucleon structure/dynamics and arrive at a consistent quark model, accurate data are essential. Recent proposed upgrades to the Main Injector Particle Production experiment (MIPP) at Fermilab will facilitate baryon spectroscopy by scanning the mass region from 1.5 to 2.5 GeV/c² while simultaneously measuring elastic and inelastic channels such as π⁻ p → π⁺π⁻ n and π⁻ p → K⁰Λ. A description of MIPP will be presented, including proposed improvements to the DAQ, lower momentum capabilities, additional plastic ball backscatter detector and upgraded veto hodoscope, as well as the theoretical motivation and expected results.

3:12PM SPS2.00007 Phoenix Mars Mission and the Phoenix Student Interns Program, KEN TAYLOR1, MATTHEW GABA2, TONY XIE3, Lake Highlands High School — Presenters of this paper will describe the Phoenix Mars Mission as participants of the Phoenix Student Interns Program (sponsored by NASA and the University of Arizona). From launch to landing and from landing to probing, the major objectives of Phoenix will be discussed. Emphasis will be placed on the various experiments that will be conducted on the Martian surface.

Friday, March 7, 2008 2:30PM - 3:30PM — Session AAPT1 Physics Teaching and Physics Education Research, Omni Corpus Christi Hotel Marina

Tower Padre A
Organizing an undergraduate research group: Graduate Mentoring, Scaffolding, and Wikis

Ramon Lopez, Robert Bruntz, University of Texas at Arlington — In this talk I will describe how my group manages a large number of undergraduates engaged in meaningful research projects. The interaction is very structured and includes considerable scaffolding to ensure student success. The undergraduates are organized into groups with specified research foci, and a graduate student assigned to each group as a mentor. Groups meet regularly on several levels, leading to a weekly whole group meeting. The structure fosters positive interdependence as well as individual responsibility as students are assigned individual projects with the research focus of the group. The use of a wiki is critical to facilitating the interaction, maintaining a record of progress, centralizing shared resources, and it allows for significant asynchronous interaction. This structure leads to student success, professional growth for graduate students, and a manageable time budget for the group leader.

Industrial Acoustics Lecture: Teaching and Research in a Laboratory Science Course

Bruce Miller, Texas Christian University — Colleges with strong music programs generally have a physics course on acoustics for non-science majors. Here I describe a laboratory science course offered at Texas Christian University for about eight years. The course incorporates thirteen laboratory experiences that include an instrument sound level comparison, an individual hearing test, and spectral analysis of each student’s instrument. The experiments form the backbone of the course and drive the lectures. I will describe them in some detail, and demonstrate some of the nearly free software that adds enrichment to both the laboratory and lectures. In addition I will explain how guest lecturers from related fields, including audiologists, psychologists, and instrument makers, can help provide a more meaningful experience for the students.

Comparison of Four Methods for Teaching Phases of the Moon

Brianna Upton, Ximena CID, Ramon Lopez, UT Arlington — Previous studies have shown that many students have misconceptions about basic concepts in astronomy. As a consequence, various interactive engagement methods have been developed for introductory astronomy. We will present the results of a study that compares four different teaching methods for the subject of the phases of the Moon, which is well known to produce student difficulties. We compare a fairly traditional didactic approach, the use of manipulatives (moonballs) in lecture, the University of Arizona Lecture Tutorials, and an interactive computer program used in a didactic fashion. We use pre- and post-testing with the Lunar Phase Concept Inventory to determine the relative effectiveness of these methods.

Activities in The Regional Collaborative for Math and Science Teaching

James Roberts. Hands-on activities in selected topics in physics continually are found to be useful in teaching the principles of mathematics and science by engaging the teachers in the projects to the extent that they become possessors of the knowledge needed to teach the children that come under their guidance in the class rooms at their home schools. We continue to provide the “hands-on, minds-on” activities that put the learner in the picture so that they gain ownership of the knowledge base. Select experiments will be discussed.

UTeach Replication: Impacting Teacher Preparation at a University Near You

Jill Marshall, University of Texas. In 2007 the National Mathematics and Science Initiative, with a grant from Exxon-Mobil, launched two major programs to improve science and mathematics education in the US: an Advanced Placement initiative and replication of the UTeach program. Twelve colleges and universities, from Florida to California, have been selected to receive grants of up to $2.4 million to start UTeach-type programs. I will report on the requirements for these grants, what it really means to have a “UTeach-type” program and the evidence that such programs can affect the quantity and quality of physics teachers in the US.

Friday, March 7, 2008 2:30PM - 3:54PM
Session APS3 Condensed Matter Physics Omni Corpus Christi Hotel Marina Tower Padre B

Polymer-Condensing Polymer Composites

Juan Monreal, Heinrich D. Foltz, Elsa Garcia, Karen Lozano, Marcos Villareal, Steven C. Tidrow, MagdalenA Dorina Chipara, Mircea Chipara, University of Texas Pan American — Polyaniline is a conducting polymer with high electrical conductivity, good thermal and thermo-oxidative resistance, and poor mechanical properties. To overcome these weaknesses, the conducting nanoparticles were dispersed within polymeric matrices characterized by high mechanical strength or high elasticity. Such composite materials found applications as lightweight antistatic materials (at low doping levels) and electromagnetic shielding capabilities (at high doping levels, typically above the percolation threshold for electrical conductivity) and exhibit potential applications as metamaterials. Nanosized particles of polyaniline were dispersed within polymeric matrices (polystyrene, polyvinylchloride, and polyethylene). The thermal properties were investigated by Thermal Analysis and Differential Scanning Calorimetry. FTIR/ATR, Raman spectroscopy, and Electron Spin Resonance spectroscopy provided additional information about the effect of nanofiller on the polymeric matrix. Electrical (dc) measurements confirmed the increase of the electrical conductivity as the concentration of conducting nanoparticle is increased and revealed a broad percolation behavior. The effect of the conducting nanofiller on the mechanical properties is reported.

Assessment of Bone Microstructural Changes by NMR

Qingwen Ni, University of Texas Pan American, Xiaodu Wang, University of Texas at San Antonio — Previous studies have shown that age related increases in bone porosity without significant changes in bone mineral density (BMD) (without bone microstructural information) result in a decrease in bone strength. Bone fracture toughness is also significantly correlated to changes in porosity, microarchitecture, collagen integrity, microdamage, and water distribution, all of which are measures of bone quality. Unfortunately, current technology does not allow the non-destructive and non-invasive detection of bone water distribution or other measures of bone quality including microporosity. On the other hand, Nuclear Magnetic Resonance (NMR) proton spin-spin (T2) relaxation time measurements and computational analytical method have been used to determine microstructural characteristics of various types of fluid filled porous materials. The study in here is to demonstrate that non-destructive and non-invasive NMR proton spin-spin (T2) relaxation techniques has been developed and applied to quantify the porosity, pore size distribution and water distribution in human cortical bone. This new bone microstructural information can then be used as descriptions of bone quality and, along in combination with existing method (BMD) to more accurately assess bone fracture risk, and the results could help doctors and researchers to detect osteoporosis and other conditions related to weak bones in persons.
2:54PM APS3.00003 Ultraviolet, Infrared, and Raman Spectra of Pyridine and Its Fluoro Derivatives, JAAN LAANE, PRAVEEN BOOPALACHANDRAN, KATHLEEN MCCANN, Texas A&M University — The vapour-phase infrared and ultraviolet absorption spectra of pyridine, pyridine-4-d, 2-fluoropyridine, and 3-fluoropyridine have been recorded. The high-temperature Raman spectra of these vapour phase samples have also been collected. DFT and ab initio calculations for each molecule were carried out for both the ground and $S_1(n,\pi^*)$ electronic excited states in order to calculate the molecular structures and vibrational frequencies, and this facilitated the assignment of the vibrational data. Comparison of the assignments for the $S_1(n,\pi^*)$ states with the electronic ground state provided an understanding of how the bonding of the molecules changes in the electronic excited states, where the molecules become much less rigid and floppy. Investigation of the $\nu_{1E}$ out-of-plane ring-bending mode for pyridine-$d_0$ and $-d_4$ allowed their potential energy function to be determined, and this demonstrated that pyridine is quasi-planar with a barrier to planarity of 3 cm$^{-1}$ in the $S_1(n,\pi^*)$ state. The decrease from 403 cm$^{-1}$ ($S_0$) to 59.5 cm$^{-1}$ ($S_1$) for the $\nu_{1E}$ vibration of pyridine reflects the decreased rigidity in the excited state.

3:06PM APS3.00004 Characterization and Optical Tuning of CdSe & ZnS Quantum Dots Generated by Laser Ablation of Microparticles, IGNACIO GALLARDO, KAY HOFFMANN, JOHN KETO, The University of Texas at Austin — CdSe and ZnS core-shell nanoparticles made by LAM (Laser Ablation of Microparticles) show photoluminescence (PL) peaks in a region of wavelengths below 400nm. Control over the size and PL peak position is obtained by irradiating the nanoparticles multiple times. In LAM, microparticle powder passes through an aerosol generator and then into a laser ablation glass cell, where a laser pulse (high energy excimer laser) ablates the microparticle aerosol. Nanoparticles are formed after condensation. At this stage the nanoparticles can be covered with a second material or irradiated multiple times to change their size. Using TEM (Transmission Electron Microscopy) measurements, CdSe particles have shown a size range that goes from 3.1 ± 0.17 nm (one ablation) to a mean radius of 2.5 ± 0.19 nm (after a second radiation). PL blue shifts are seen as the mean size decreases. A thermodynamic numerical calculation based on evaporation models and Mie absorption during the LAM process supports the blue shifting of the PL peaks by showing a decrease in particle size as they are exposed to multiple laser irradiations.

3:18PM APS3.00005 Photonic Band Gap and Negative Refraction in Two-dimensional Photonic Crystals with Centered Rectangular Symmetry, KRIS OHLINGER, Department of Physics and Geology, University of Texas-Pan American, Edinburg, TX 78539, YUANKUN LIN, Department of Physics and Geology, University of Texas-Pan American, Edinburg, Texas, 78539 — We report photonic band gaps in two-dimensional photonic crystals with centered rectangular lattices of elliptical air rods in a silicon background for both transverse electric and transverse magnetic polarizations. The calculations have revealed the existence of large complete photonic band gaps in those photonic crystals. Negative refractive behaviors have also been studied in these two-dimensional centered rectangular elliptical-rod photonic crystals.

3:30PM APS3.00006 Photonic Band Gap Calculation and Holographic Fabrication of Orthorhombic and Tetragonal 3D Photonic Crystals, KRIS OHLINGER, Department of Physics and Geology, University of Texas-Pan American, Edinburg, TX 78539, YUANKUN LIN, Department of Physics and Geology, UTPA, Edinburg, Texas, 78539, DI XU, KEVIN CHEN, Department of Electrical and Computer Engineering, University of Pittsburgh, Pittsburgh, PA 15261 — We report a photonic band gap (PBG) and fabrication of both orthorhombic and tetragonal photonic crystals. 3D photonic crystal structures were formed by a double-exposure of photoresist SU8 through a phase mask. Lattice structures and PBG can be controlled by the rotational angles of the phase mask between two exposures. PBG computation predicts that the photonic crystal structure with the optimized bandgap can be realized when the rotational angle is set between 50 and 70 degrees. A photonic crystal template by 60-degree phase mask rotation was fabricated in SU8.

3:42PM APS3.00007 Functionalized Nanomaterials to Sense Toxins/Pollutant Gases Using a Resonant Cavity, JAMES ROBERTS, University of North Texas, JAI DAHIYA, Southeast Missouri State University, AMAN ANAND, University of North Texas — This paper provides an overview of the techniques and methods involving electromagnetic resonators to study the interactions of gas molecules with substrates. A resonant cavity operating in TE$_{01}$ mode was employed to characterize the nature of interactions of a range of weakly polar to non-polar gas molecules with carbon nanotubes loaded in the cavity. Resonant cavities are special electromagnetic resonators which can have a very high quality factor; which enhances the sensitivity of the apparatus as compared to standard electrical tank circuits. Shifts in the resonant frequency of these circuits for gas pressure changes provides a highly effective means to quantify the nature of agents perturbing the cavity. By functionalizing the nanomaterials with specific anti-bodies and loading them as wicks in these cylinders, the technique can be engineered into a very sensitive and unique chemical and biological sensor prototype.

3:45PM SS1 AAPT/SPS Special Session Omni Corpus Christi Hotel Marina Tower Riviera I

Friday, March 7, 2008 3:45PM - 6:30PM —

3:45PM SS1.00001 Future Faces of Physics, TONI SAUNCY, Angelo State University — This 45-minute program's theme will be the National SPS focus on diversity in physics and will include several activities including Physics Jeopardy.

4:30PM SS1.00002 High School Roundtable Discussion on the Process and Implications of the Physics TEKS Revision, HUGH HENDERSON, Birdville ISD — On January 29 - February 2, 2008, several committees appointed by the Texas State Board of Education and consisting of high school and college teachers met in Austin to revise the Texas Essential Knowledge and Skills (TEKS) for all high school science courses, including physics, chemistry, integrated physics and chemistry (IPC), biology, astronomy, environmental systems, and aquatic science. Members of the Physics TEKS revision committee were Jill Marshall, Daniel Marble, Jeff Funkhouser, Cheryl Cowley, and Hugh Henderson. The committee members began the process by considering the revision suggestions made by members of TSAAAPT during the past year. This year's session will clarify the TEKS revision process and communicate the changes to the Physics TEKS suggested by the committee, as well as provide a panel discussion on political and policy implications of TEKS revision, implications of TEKS revision for future teachers, and possible implications for physics education at the university level. All pre-college science teachers and college faculty are encouraged to attend and join the discussion.

In collaboration with Chris Comer, Science Consultant; Jill Marshall, University of Texas; David Bixler, Angelo State University; and Toni Sauncy, Angelo State University.
A thorough study of the scattering characteristics of these tissues has been made. This work was supported in part by the NSF sponsored Center for Biophotonics by using a double-integrating sphere setup. The index of refraction of the tissues will be determined using conventional optical techniques. The Kubelka Munk function is sensitive to the scattering properties of the tissue. We have also characterized these tissues with Transmission Electron Microscopy.

During dissociation. We made a successful attempt to determine the geometry of electronically excited dicationic precursor in the CM frame. Experimentally, the molecular ion is significantly altered from the geometry of the parent neutral. These observations suggest relocation of certain atoms within the molecular ion when excited. The ground state geometry of the two does not support the formation of these unusual dissociative products. This implies that the geometry of the dissociating fragment. Molecular ions Molecular ion possesses a set of configurations with a certain symmetry. All these configurations have different electronic energy and depending on the energies the molecular ion follows different decay pathways. To obtain the properties of electronic states of the precursor ion and to understand the energetics of the break up, it is necessary to measure complete kinematic parameter of all ionic fragments. We investigate dissociation dynamics of the multiply charged molecular ions, or precursors, by multiple ion coincidence imaging of fragment ions. We have probed dynamics of the unimolecular process. The molecular ions were characterized by Transmission Electron Microscopy.

We present FTIR, Raman, and XPS studies of a Thioindigo/Palygorskite Pigment. WILLIAM DURRER, FELICIA MANCIU, Physics Department, ALEJANDRA RAMIREZ, Materials Research and Technology Institute and Chemistry Department. JAYESH GOVANI, Physics Department, RUSSELL CHIANELLI, Materials Research and Technology Institute and Chemistry Department, University of Texas at El Paso, TX 79968 — We present FTIR, Raman, and XPS studies of interactions between powdered thioindigo and palygorskite when these two substances are mixed and heated to produce a purple pigment similar to Maya Blue. In an ongoing investigation, we study the question of how thioindigo binds to palygorskite. We also address how such binding might be affected by varying the proportion of dye relative to that of the mineral, and by varying the length of heating time used in preparation. FTIR and Raman results corroborate to provide evidence of C=O bonding disruption in the dye. XPS results, though more difficult to interpret, support the FTIR and Raman results. They reveal several different binding states of the key elemental components oxygen, aluminum, and sulfur. Of these, the higher energy binding states of oxygen and aluminum are, most likely, indicative of strong metal-C=O interaction.

FTIR and of the coupled phonon modes. The samples were characterized by Transmission Electron Microscopy.

POS.00004 Optical properties of L-arginine doped potassium dihydrogen phosphate crystals. JILA, University of Colorado, Boulder, CO, 80303, USA, BHAS BAPAT, Physical Research Laboratory, Ahmedabad 380009, India, MARGARET MURNANE, HENRY KAPTEYN, JILA, University of Colorado, Boulder, CO, 80303, USA, PHYSICAL RESEARCH LABORATORY, AHMEDABAD 380009, INDIA TEAM, JILA, UNIVERSITY OF COLORADO, BOULDER, CO, 80303, USA TEAM — Highly charged molecular ions, formed by either photoabsorption or charged particle impact, undergo dissociation. Dissociation leads to a sharing of the total molecular charge and conversion of the internal energy into translational energy of the fragment. Infrared absorption spectra were employed to study the active doping of potassium dihydrogen phosphate with L-arginine amino acid. IR absorption spectra confirmed that the successful doping of L-arginine was achieved by exhibiting the presence of vibrational lines at 1401 cm⁻¹, 1637 cm⁻¹, 1716 cm⁻¹ and 3127 cm⁻¹. This affirmation is supported with more evidences from FT-Raman measurements.

POS.00005 Fragmentation dynamics of highly symmetric molecules. VANDANA SHARMA, JILA, University of Colorado, Boulder, CO, 80303, USA, BHAS BAPAT, Physical Research Laboratory, Ahmedabad 380009, India, MARGARET MURNANE, HENRY KAPTEYN, JILA, University of Colorado, Boulder, CO, 80303, USA — We have probed the fragmentation dynamics of CCl₄ and SF₆ molecules which are highly symmetric. The common thread between the two is that the parent ion (SF₆⁺ and CCl₄⁺) did not appear at all in the mass spectrum of the two. Hence, it can be concluded that these ions are unstable in its symmetrical configuration and exhibit Jahn–Teller instability [1].

POS.00006 Optical Characterization of Biological Tissues. L. MIMUN, FREDERICK BARRERA, DHIRAJ SARDAR, ANDREW TSION — University of Texas at San Antonio, San Antonio, Texas 78249 An in-depth characterization of the optical properties of biological tissues has been performed. The wavelength-dependent total diffuse reflection (R_d) and total transmission (T_r) measurements have been taken for individual tissues by using a double-integrating sphere setup. The index of refraction of the tissues will be determined using conventional optical techniques. The Kubelka Munk theory is applied to determine the scattering and absorption coefficients of these samples from the measurements of diffuse transmission and reflection. A thorough study of the scattering characteristics of these tissues has been made. *This work was supported in part by the NSF sponsored Center for Biophotonics Science and Technology (CBST) at UC Davis under Cooperative Agreement No. PHY 0120999.

POS.00001 Size-dependent Raman and infrared studies of PbSe nanoparticles. FELICIA MANCIU, Physics Department, FRANCISCO CARRETO, Physics Department, University of Texas at El Paso, TX 79968, YUDHISTHIRA SAHOO, Institute for Lasers, Photonics and Biophotonics, PARAS PRASAD, Institute for Lasers, Photonics and Biophotonics, Buffalo, NY 14260 — The existence of optical phonon modes of PbSe nanoparticles (NP) prepared by colloidal chemistry were investigated by micro-probe Raman and far-infrared absorption spectroscopies. To the best of our knowledge, this is the first time when evidence of the surface phonon (SP) mode by Raman has been experimentally observed. The frequency of the SP mode is consistent with its prediction by a dielectric continuum model. While for different PbSe NP sizes the frequency of the SP mode is almost unaffected, there is a clear shift by approximately 4 cm⁻¹ toward higher frequency in the appearance of the longitudinal optical mode in the Raman spectra from the 3 nm to the 7 nm PbSe NPs. Far-infrared measurements demonstrate the presence of the transverse optical TO(1) and of the coupled phonon modes. The samples were also characterized by Transmission Electron Microscopy.

POS.00002 FTIR, Raman, and XPS Studies of a Thioindigo/Palygorskite Pigment. WILLIAM DURRER, FELICIA MANCIU, Physics Department, ALEJANDRA RAMIREZ, Materials Research and Technology Institute and Chemistry Department, JAYESH GOVANI, Physics Department, RUSSELL CHIANELLI, Materials Research and Technology Institute and Chemistry Department, University of Texas at El Paso, TX 79968 — We present FTIR, Raman, and XPS studies of interactions between powdered thioindigo and palygorskite when these two substances are mixed and heated to produce a purple pigment similar to Maya Blue. In an ongoing investigation, we study the question of how thioindigo binds to palygorskite. We also address how such binding might be affected by varying the proportion of dye relative to that of the mineral, and by varying the length of heating time used in preparation. FTIR and Raman results corroborate to provide evidence of C=O bonding disruption in the dye. XPS results, though more difficult to interpret, support the FTIR and Raman results. They reveal several different binding states of the key elemental components oxygen, aluminum, and sulfur. Of these, the higher energy binding states of oxygen and aluminum are, most likely, indicative of strong metal-C=O interaction.

POS.00003 Role of symmetry in dissociation of highly symmetric molecules. VANDANA SHARMA, JILA, University of Colorado, Boulder, CO, 80303, USA, BHAS BAPAT, Physical Research Laboratory, Ahmedabad 380009, India, MARGARET MURNANE, HENRY KAPTEYN, JILA, University of Colorado, Boulder, CO, 80303, USA — Highly charged molecular ions, formed by either photoabsorption or charged particle impact, undergo dissociation. Dissociation leads to a sharing of the total molecular charge and conversion of the internal energy into translational energy of the fragment. Molecular ions Molecular ion possesses a set of configurations with a certain symmetry. All these configurations have different electronic energy and depending on the energies the molecular ion follows different decay pathways. To obtain the properties of electronic states of the precursor ion and to understand the energetics of the break up, it is necessary to measure complete kinematic parameter of all ionic fragments. We investigate dissociation dynamics of the multiply charged molecular ions, or precursors, by multiple ion coincidence imaging of fragment ions. We have probed dynamics of the unimolecular fragmentation of tetrahedral (CCl₄) and octahedral (SF₆) molecules which are highly symmetric. The common thread between the two is that the parent ion (SF₆⁺ and CCl₄⁺) did not appear at all in the mass spectrum of the two. Hence, it can be concluded that these ions are unstable in its symmetrical configuration and exhibit Jahn–Teller instability [1].
POS.00007 The Relationship Between Magnetosheath and Solar Wind Parameters

PHYL LIS WHITTELEY, CRYSTAL RED EAGLE, ELIZABETH MITCHELL, RAMON LOPEZ, UT Arlington — In general, the solar wind drives magnetospheric activity and is used to quantify it. In reality, it is the magnetosheath which is in contact with the magnetosphere. The magnetosheath therefore dictates magnetospheric activity. We expect that the relationship between solar wind and magnetosheath parameters will have a linear relationship at low solar wind magnetic field values. However, at high solar wind magnetic field values, the LFM Global MHD code predicts a non-linear relationship between the solar wind and magnetosheath parameters. Using simultaneous spacecraft observations from WIND and GEOTAIL, we examine two periods of magnetosheath and solar wind measurements to confirm the observed relationship between the magnetosheath and solar wind parameters. For low solar wind magnetic field, we examine a period of quiet solar wind and magnetospheric activity on January 5, 1995. For high solar wind magnetic field, we examine the well-known January 10, 1997 storm period.

1 This material is based upon work supported by CISM, which is funded by the STC Program of the National Science Foundation under Agreement Number ATM-0129950.

POS.00008 Is All v*Bz Equal?

FELIPE MULFORD, JORGE LANDIVAR, ELIZABETH MITCHELL, RAMON LOPEZ, UT Arlington — Solar wind electric field, v*Bz, is generally viewed to be the major driver of magnetospheric activity. A major diagnostic of magnetospheric activity is the potential imposed on the ionosphere. In this study we examine if, in fact, the ionospheric potential is the same for similar values of v*Bz or whether the average potential depends on how big the v and Bz are relative to each other. We use data from DMSP spacecraft collected during periods when v*Bz is less than 3 mV/m, in order to avoid the effect of polar cap potential saturation. Global MHD models suggest that there should be a difference in the magnetospheric response. We will present our findings from the data.

1 This material is based upon work supported by CISM, which is funded by the STC Program of the National Science Foundation under Agreement Number ATM-0129950, and by NSF grant GEO-0607195.

POS.00009 DMSP Observations of Auroral Arcs that Brighten

JOSE BARONA, RANDALL BRADSHAW, ROBERT BRUNTZ, RAMON LOPEZ, UT Arlington — Using images from the POLAR UVI substorm movie database, we have identified the local time, latitude, and universal time, within a couple of minutes of, auroral brightenings. Using that list we have identified a number of events in which DMSP spacecraft pass directly over the portion of the arc that either was about to brighten or had just brightened. In some of these cases, there is apparent evidence of an ion acceleration region in the magnetotail. Our presentation will discuss in general the characteristics of electron and ion precipitation during these events.

1 This material is based upon work supported by CISM, which is funded by the STC Program of the National Science Foundation under Agreement Number ATM-0129950, and by NSF grant GEO-0607195.

Friday, March 7, 2008 7:00PM - 9:00PM —
Session Q1 Banquet Omni Corpus Christi Hotel Marina Tower Riviera III

7:00PM Q1.00001 Banquet —

8:00PM Q1.00002 The Physics of Hang Gliding

LIONEL D. HEWETT, Texas A and M University, Kingsville — Dr. Hewett has received both national and international awards from the hang gliding community for his contributions to the safety of towing hang gliders. These contributions resulted from his applying his knowledge of physics to the sport of hang gliding. This lecture illustrates how these and other applications of the fundamental principles of physics have influenced the historical evolutions of hang gliding and paragliding from the earliest flights of Otto Lilienthal in 1891 through the more recent record breaking flights of more than 430 miles from Zapata Texas.

Saturday, March 8, 2008 8:15AM - 9:55AM —
Session PL2 Plenary Session II Omni Corpus Christi Hotel Marina Tower Riviera I

8:15AM PL2.00001 Video Analysis and Modeling in Physics Education

DOUG BROWN, Cabrillo College — The Tracker video analysis program allows users to overlay simple dynamical models on a video clip. Video modeling offers advantages over both traditional video analysis and animation-only modeling. In traditional video analysis, for example, students measure "g" by tracking a dropped or tossed ball, constructing a position or velocity vs. time graph, and interpreting the graphs to obtain initial conditions and acceleration. In video modeling, by contrast, the students interactively construct theoretical force expressions and define initial conditions for a dynamical particle model that synchs with and draws itself on the video. The behavior of the model is thus compared directly with that of the real-world motion. Tracker uses the Open Source Physics code library so sophisticated models are possible. I will demonstrate and compare video modeling with video analysis and animation-only modeling. In traditional video analysis, for example, students measure "g" by tracking a dropped or tossed ball, constructing a position or velocity vs. time graph, and interpreting the graphs to obtain initial conditions and acceleration. In video modeling, by contrast, the students interactively construct theoretical force expressions and define initial conditions for a dynamical particle model that synchs with and draws itself on the video. The behavior of the model is thus compared directly with that of the real-world motion. Tracker uses the Open Source Physics code library so sophisticated models are possible. I will demonstrate and compare video modeling with video analysis and I will discuss the advantages of video modeling over animation-only modeling. The Tracker video analysis program is available at: http://www.cabrillo.edu/~dbrown/tracker/.

1 Partial funding was provided by NSF grant DUE-0442581.

9:05AM PL2.00002 GLAST: The Gamma-ray Large Area Space Telescope Mission

PETER F. MICHELSON, Stanford University — The Gamma-ray Large Area Space Telescope, GLAST, is an observatory that will measure the cosmic gamma-ray flux in the energy range 20 MeV to >300 GeV, with supporting measurements for gamma-ray bursts from 10 keV to 25 MeV. With its launch now planned for May 2007, the Large Area Telescope on GLAST, with a factor of 40 or more improvement in sensitivity, large FOV, and much finer angular resolution compared to previous high-energy telescopes, will provide an important window on a wide variety of high energy phenomena, including black holes and active galactic nuclei; gamma-ray bursts; the origin of cosmic rays and supernova remnants; and searches for hypothetical new phenomena such as supersymmetric dark-matter annihilations and exotic relics from the Big Bang. This talk will provide an overview of telescope design and the science opportunities.

Saturday, March 8, 2008 9:00AM - 1:00PM —
Session W3 AAPT Workshop III: Radiation and Health Omni Corpus Christi Hotel Marina Tower Padre C
Negative at valence band, electrons move to the opposite direction of its Lorentz force, which behaves like a positive charge and gives positive current direction under external electric field. However, under the influence of external magnetic field, because the mass of electrons is very small, holes are current carriers, the Hall coefficient is positive, i.e. $R_H > 0$. Beyond the very core of the magnetic dipole, each of these two velocities is essentially $c$ and $\frac{v_x E}{c^2} = \frac{v_x B}{c^2} = B$. The anisotropy of the $v_x E/c^2$ field is cured by precession about an inclined axis. Choosing a Bohr magnetron for the magnetic dipole and assuming it spins at the Compton frequency, Gauss' law finds $Q = e$. Charge is useful but not fundamental. With this, Maxwell's equations can be written in terms of the $E$ and $B$ fields alone.

Using the inverse square law from Quantum Field Theory, the presence of two particles in a massless boson field will yield an inverse square attractive force.

The physics of the very small using a very large machine.

New fission cross section measurements using a time projection chamber.

Returning to lattice QCD.

Calibrating scintillator position measurement for testing RPC modules for PHENIX at RHIC.

Holes in Hall Effect.
10:42AM AAPT2.00002 Summative Evaluation of Polymers, Composites & Sports Materials: An Introduction to Chemistry and Physics.¹

ERIC HAGEDORN, UTEP Physics, MILIJANA SUSKAVCEVIC TEAM, DAVID CHAVEZ TEAM — During Fall 2007, 70 pre-science freshman completed a one-credit science course with three goals: 1) enhance and maintain student interest in science majors while completing necessary prerequisite mathematics courses, 2) provide students with a solid content & mathematical foundation for introductory physics and chemistry, and 3) pilot hands-on activities developed for the Materials World Modules program. Eight pre/post quizzes, along with a midterm and final were used to assess student learning. Traditional course evaluations were supplemented with completed SALG (Student Assessment of Learning Gains) instruments. Analysis of these data indicated the following: 1) on 6 out of 7 pre-post quizzes, students showed statistically significant gains with medium or large effect sizes, 2) while students who completed the SALG instrument found all aspects of the course helpful, the hands-on activities were not as helpful as intended, and 3) logistical issues had the most detrimental impact on this course. The evaluation results have led to a number of changes for the Fall 2008 offering of this course.

¹This work supported by a grant from the Army Research Office

10:54AM AAPT2.00003 Formula recollection through a never before seen mnemonic technique

SHANNON SCHUNICHT, Texas A&M — While in the Army Mr. Schunicht was involved in a mid-air collision rendering him unconscious for three weeks. Everything had to be re-learned, as nursing actions were reported as having been displayed upon awakening from the extended unconsciousness (19 days). Studies in recovery brought about some pragmatic discoveries to compensate for the residual memory deficits. The most valuable discovery was having each vowel represent a mathematical sign, i.e. “a” multiplication implying “@”, “o” for division implying “over”, “i” for subtraction implying “minus”, “u” for addition implying “plus”, and “e” implying “equals”. Most constants and variables are indeed consonants, e.g. “c” = “speed of light” & “R” = “Rate/time variable”. ******Note with this technique, additional letters may be added to enhance the letter combination’s intelligibility, but these additional letters need ONLY be consonants. Examples will be shown of this techniques applicability to common physics formulas. Sample cards will be distributed with the presented information. For this reason, “note taking” equipment is not required, just attendance!

11:06AM AAPT2.00004 An Examination of Temperature Fluctuations in the Sargasso Sea

JAMES ROBERTS, University of North Texas — Temperature data for the period of time -1000 b.c. to 2000 a. d. for the Sargasso Sea have been examined for patterns that signal global warming or global cooling during that period of time. Different periods of time are examined and human events correlated with activities in the temperature to assess the impact of temperature change on human activity. Indicators in the temperature indicate a time when Greenland lived up to its name and was green and settled by the Vikings. A significant signature around -500 b.c. indicates a cataclysmic event of perhaps 100+ years duration befell the Earth. Was this event manmade or of Cosmic origin? Segments of time will be examined for trends in temperature that are assumed to be global in nature to look for signatures of global warming and/or global cooling.

11:18AM AAPT2.00005 Using PhET Simulations in the Introductory Physics Classroom

PAUL WILLIAMS, Austin Community College — The PhET package of simulations developed at the University of Colorado (http://phet.colorado.edu) is a free package of simulations available on the web covering a wide variety of topics in introductory physics. The author has explored a number of ways to use these simulations in introductory Physics courses including: incorporating them as interactive lecture demonstrations; as part of lab activities; as standalone guided inquiry activities; and as part of conceptual exercises. A few sample activities will be presented as well as some preliminary assessments of effectiveness.