Fall 2007 Joint Meeting

Texas Sections of the

American Physical Society
American Association of Physics Teachers

Zone-13 of the Society of Physics Students
Forum on Industral and Applied Physics
National Society of Hispanic Physicists
National Society of Black Physicists

Hosted by the
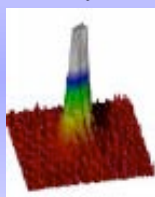### *Mitchell Institute of Fundamental Physics and Astronomy*
and the
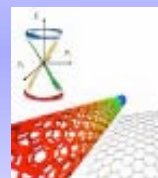### *Department of Physics*
Texas A&M University

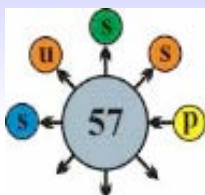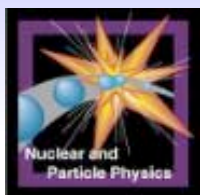Thursday-Saturday, October 18-20, 2007

Atomic, Molecular, and Optical Physics

Condensed Matter Physics

Nuclear and High Energy Physics

2007 Nobel Prize in Physics
Giant Magnetoresistance
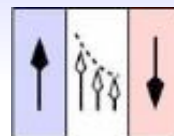
Astronomy and Astrophysics
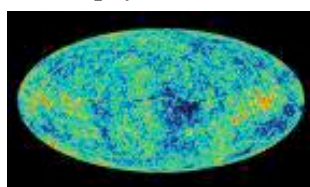
Local Organizers:

Dr. Roland Allen

Dr. Teruki Kamon

Dr. Wayne Saslow

Beverly Guster, Program Coordinator

Jessica Fletcher, First Office Assistant

Neal Blackman, Computer Specialist

Tony Ramirez, Lab Manager

Physics Department Faculty & Staff

Ke Wang, Student Worker

Lianxi Ma, Student Worker

Mario Borunda, Student Worker

Juntao Chang, Student Worker

Melissa Fuller, Student Worker

Gleb Zhelezov, Student Worker

Stuart Foster, Student Worker

2007 Joint Fall Meeting of the Texas Sections of the APS and AAPT; Zone 13 of SPS

Thursday–Saturday, October 18–20, 2007; College Station, Texas

Invited Speakers

Baker, Keith
Yale University

Session I1.00002 **Exciting Prospects and New Experiments in both High Energy and Nuclear Physics** Room: *Rudder Tower 601*

Brownlee, Don
University of Washington

Session N1.00001 **Stardust** Room: *Rudder Tower 601*

Engel, Don
National APS

Session E1.00002 **China and India: A New Sputnik?** Room: *Rudder Tower 601*

Herschbach, Dudley
Departments of Physics and Chemistry, Texas A\&M University & Harvard University

Session A1.00001 **Einstein's Theory of Specific Heats: The Third Coming of Planck's Constant** Room: *Rudder Tower 601*

Jerome, Fred
Jounalist

Session H1.00001 **Einstein on Race and Racism, presented by Fred Jerome and Rodger Taylor** Room: *Memorial Student Center 224*

Katzgraber, Helmut
Swiss Federal Institute of Technology Zürich

Session C1.00001 **The Physics of Diving** Room: *Rudder Tower 601*

Katzgraber, Helmut
Swiss Federal Institute of Technology Zürich

Session K1.00001 **The Physics of Diving** Room: *Rudder Tower 601*

Macri, Lucas
National Optical Astronomy Observatory

Session K1.00002 **How to Measure the Age of the Universe** Room: *Rudder Tower 601*

Macri, Lucas
National Optical Astronomy Observatory

Session M1.00003 **How to Measure the Age of the Universe** Room: *Rudder Tower 601*

Newton, Joseph
Dean of the College of Science Texas A&M University

Session 0A1.00001 **Greeting** Room: *Rudder Tower 601*

Osheroff, Doug
Stanford University

Session A1.00002 **How Advances in Science Are Made** Room: *Rudder Tower 601*

Papovich, Casey
Steward Observatory, University of Arizona

Session M1.00002 **Probing the Universe in the Infrared with the Spitzer Space Telescope** Room: *Rudder Tower 601*

Smoliar, Laura
Mobius Photonics

Session I1.00001 **Starting a Photonics Company After the Telecom Meltdown** Room: *Rudder Tower 601*

Taylor, Rodger
New York Public Library

Session H1.00001 **Einstein on Race and Racism, presented by Fred Jerome and Rodger Taylor** Room: *Memorial Student Center 224*

Thomas, Robert Hyer

Session D1.00001 **The Teaching Legacy of Robert S. Hyer** Room: *MSC 224*

Tran, Vy
Institute for Astronomy, ETH

Session M1.00001 **The Great Observatories: New Windows into the Universe** Room: *Rudder Tower 601*

Vilches, Oscar
University of Washington

Session E1.00001 **One-, Two-, and Three-Dimensional Physics with Films Adsorbed on Carbon Nanotube Bundles** Room: *Rudder Tower 601*

The George P. and Cynthia Woods Mitchell
Institute for Fundamental Physics & Astronomy
Texas A&M Physics Department
Texas Section American Physical Society
Texas Section American Association of Physics Teachers
website for maps and other information: http://txaps07.physics.tamu.edu

Friday, October 19th
Rudder Tower, Room 601

9:00-9:45 AM	"Einstein's Theory of Specific Heats: The Third Coming of Planck's Constant"	**Dudley Herschbach** Nobel Laureate Harvard University and Texas A&M University
9:45-10:30 AM	"How Advances in Science Are Made"	**Douglas Osheroff** Nobel Laureate Stanford University
11:00-11:30 AM	"The Physics of Diving"	**Helmut Katzgraber** Swiss Federal Institute of Technology, Zürich
2:00-2:45 PM	"One, Two, and Three Dimensional Physics with Films Absorbed on Carbon Nanotube Bundles"	**Oscar Vilches** University of Washington
2:45-3:15 PM	"China and India: A New Sputnik?"	**Don Engel** Senior Science Policy Fellow, American Physical Society

Saturday, October 20th
Rudder Tower, Room 601

9:00-9:45 AM	"Starting a Photonics Company After the Telecom Meltdown"	**Laura Smoliar** CEO and Founder of Mobius Photonics
9:45-10:30 AM	"Exciting Prospects and New Experiments in both High Energy and Nuclear Physics"	**Keith Baker** Yale University
11:00-11:30 AM	"La Física del Buceo" en español	**Helmut Katzgraber** Swiss Federal Institute of Technology, Zürich
11:30-12:00 PM	"Como Medir la Edad del Universo" en español	**Lucas Macri** National Optical Astronomy Observatory
1:30-2:00 PM	"The Great Observatories: New Windows into the Universe"	**Kim-Vy Tran** University of Zürich
2:00-2:30 PM	"Probing the Universe in the Infrared with the Spitzer Space Telescope"	**Casey Papovich** Steward Observatory, University of Arizona
2:30-3:00 PM	"How to Measure the Age of the Universe"	**Lucas Macri** National Optical Astronomy Observatory

The George P. Mitchell Annual Lecture in Astronomy

4:00-5:00 PM	"Stardust: A NASA Comet Exploration Mission"	**Don Brownlee** University of Washington

2007 Joint Fall Meeting of the Texas Sections of the APS and AAPT; Zone 13 of SPS

Thursday–Saturday, October 18–20, 2007; College Station, Texas

Oct 19 2007 8:45AM, Friday

Session 0A1 <u>Greeting Session</u> Chair: *Edward Fry, Texas A&M University* Room: *Rudder Tower 601*
Invited Speakers: *Michael Hall, Associate Dean of the College of Science*

Oct 19 2007 9:00AM, Friday

Session A1 <u>Invited Session: Two Nobel Laureates</u> Chair: *Edward Fry and Glenn Agnolet, Texas A&M University* Room: *Rudder Tower 601*
Invited Speakers: *Herschbach, Osheroff*

Oct 19 2007 10:40AM, Friday

Session B1 <u>CM1: Condensed Matter</u> Chair: *Artem Abanov, Texas A&M University* Room: *Rudder Tower 401*

Session B2 <u>AMO1: Atomic, Molecular and Optical Physics</u> Chair: *Olga Kocharovskaya, Texas A&M University* Room: *Rudder Tower 501*

Session B3 <u>HEN1: High Energy/Nuclear</u> Chair: *Robert Webb, Texas A&M University* Room: *Rudder Tower 701*

Session B4 <u>AS1: Astrophysics, Space Physics, Astronomy and Cosmology</u> Chair: *Kevin Krisciunas, Texas A&M University* Room: *Rudder Tower 510*

Session B5 <u>GEN1: Biological, Chemical and General Physics</u> Chair: *Alexei Sokolov, Texas A&M University* Room: *Rudder Tower 504*

Session B6 <u>P1: Poster Session I: Condensed Matter and Atomic, Molecular, and Optical</u> Chair: *Andrea Burzo, Texas A&M University* Room: *MSC 292*

Session B7 <u>AAPTK12: AAPT Pre-College Teaching and Teacher Education-Honoring Robert Beck Clark</u> Chair: *Thomas O'Kuma, Lee College* Room: *Rudder Tower 707*

Oct 19 2007 11:00AM, Friday

Session C1 <u>Invited Session: The Physics of Diving</u> Chair: *Roland Allen, Texas A&M University* Room: *Rudder Tower 601*
Invited Speakers: *Katzgraber*

Oct 19 2007 1:30PM, Friday

Session D1 <u>**Post Luncheon Talk: The Teaching Legacy of Robert S. Hyer**</u> Chair: *Dwight Russell* Room: *MSC 224*
Invited Speakers: *Thomas*

Oct 19 2007 2:00PM, Friday

Session E1 <u>**Invited Session: Vilches and Engel**</u> Chair: *Joseph Ross and Roland Allen, Texas A&M University* Room: *Rudder Tower 601*
Invited Speakers: *Vilches, Engel*

Session E2 <u>**HEN2: High Energy/Nuclear**</u> Chair: *Peter McIntyre, Texas A&M University* Room: *Rudder Tower 701*

Oct 19 2007 3:30PM, Friday

Session F1 <u>**CM2: Condensed Matter**</u> Chair: *Winfried Teizer, Texas A&M University* Room: *Rudder Tower 401*

Session F2 <u>**CM3: Condensed Matter**</u> Chair: *Michael Weimer, Texas A&M University* Room: *Rudder Tower 510*

Session F3 <u>**AMO2: Atomic, Molecular and Optical Physics**</u> Chair: *John Reading, Texas A&M University* Room: *Rudder Tower 501*

Session F4 <u>**GEN2: Biological, Chemical and General Physics**</u> Chair: *Jaan Laane, Texas A&M University* Room: *Rudder Tower 504*

Session F5 <u>**Session F5 Has Been Moved to Session B7**</u>

Session F6 <u>**P2: Poster Session II**</u> Chair: *Penwang Zhai, Texas A&M University* Room: *MSC 292*

Session F7 <u>**W1: AAPT Scheduled Workshops**</u> Room: *Heldenfels Hall 219*

Session F8 <u>**W2: AAPT Scheduled Workshops**</u> Room: *Heldenfels Hall 217*

Oct 19 2007 3:45PM, Friday

Session G1 <u>**HEN3: High Energy/Nuclear**</u> Chair: *James White, Texas A&M University* Room: *Rudder Tower 701*

Oct 19 2007 7:00PM, Friday

Session H1 <u>After Dinner Talk: Einstein on Race and Racism</u> Chair: *David Ernst, Texas A&M University* Room: *Memorial Student Center 224*
Invited Speakers: *Jerome, Taylor*

Oct 20 2007 9:00AM, Saturday

Session I1 <u>Invited Session: Smoliar and Baker</u> Chair: *Saskia Mioduszewski, Texas A&M University* Room: *Rudder Tower 601*
Invited Speakers: *Smoliar, Baker*

Oct 20 2007 10:40AM, Saturday

Session J1 <u>CM4: Condensed Matter</u> Chair: *Don Naugle, Texas A&M University* Room: *Rudder Tower 401*

Session J2 <u>CM5: Condensed Matter</u> Chair: *Chia-Ren Hu, Texas A&M University* Room: *Rudder Tower 504*

Session J3 <u>AMO3: Atomic, Molecular and Optical Physics</u> Chair: *Alexandre Kolomenski, Texas A&M University* Room: *Rudder Tower 501*

Session J4 <u>HEN4: High Energy/Nuclear</u> Chair: *Dave Toback, Texas A&M University* Room: *Rudder Tower 701*

Session J5 <u>AS2: Astrophysics, Space Physics, Astronomy and Cosmology</u> Chair: *Casey Papovich, Steward Observatory, University of Arizona* Room: *Rudder Tower 510*

Session J6 <u>AAPTCOLL: AAPT College Teaching</u> Chair: *Jill Marshall, University of Texas* Room: *Rudder Tower 707*

Session J7 <u>SPS: SPS Outreach Education and Student Research</u> Chair: *Bhaskar Dutta, Texas A&M University* Room: *Rudder Tower 301*

Session J8 <u>W3: AAPT Scheduled Workshops</u> Room: *Heldenfels Hall 219*

Session J9 <u>W4: AAPT Scheduled Workshops</u> Room: *Heldenfels Hall 208*

Oct 20 2007 11:00AM, Saturday

Session K1 <u>Invited Session: Macri and Katzgraber (in Spanish)</u> Chair: *Katrin Becker, Texas A&M University* Room: *Rudder Tower 601*
Invited Speakers: *Katzgraber, Macri*

Oct 20 2007 12:40PM, Saturday

Session L1 <u>W5: AAPT Scheduled Workshops</u> Room: *Heldenfels Hall 220*

Oct 20 2007 1:30PM, Saturday

Session M1 <u>Invited Session: Astronomy</u> Chair: *Edward Fry, Texas A&M University* Room: *Rudder Tower 601*
Invited Speakers: *Tran, Papovich, Macri*

Oct 20 2007 4:00PM, Saturday

Session N1 <u>Annual George P. Mitchell Lecture in Astronomy</u> Chair: *Vy Tran, Institute for Astronomy, ETH* Room: *Rudder Tower 601*
Invited Speakers: *Brownlee*

2007 Joint Fall Meeting of the Texas Sections of the APS and AAPT; Zone 13 of SPS

College Station, Texas

Friday, October 19, 2007 8:45AM - 9:00AM –
Session 0A1 Greeting Session Rudder Tower 601

8:45AM 0A1.00001 Greeting JOSEPH NEWTON, Dean of the Texas A&M University College of Science —

Friday, October 19, 2007 9:00AM - 10:30AM –
Session A1 Invited Session: Two Nobel Laureates Rudder Tower 601

9:00AM A1.00001 Einstein's Theory of Specific Heats: The Third Coming of Planck's Constant
, DUDLEY HERSCHBACH, Departments of Physics and Chemistry, Texas A&M University — Today, Einstein's explanation in 1907 of the marked drop in the specific heat of diamond with decreasing temperature is overshadowed by admiration for his Annus Mirabilis of 1905, introducing his light-quantum (the "second coming of h"), Brownian motion, and special relativity. Back then, however, his specific heat theory had far greater impact on the thinking of contemporary physicists and his reputation. This talk will explore instructive aspects of the historical context, particularly the symbiotic relationship between the development of quantum theory and the Third Law of thermodynamics. Also, recent tantalizing work will be mentioned that resembles the approach young Einstein took a century ago.

9:45AM A1.00002 How Advances in Science Are Made , DOUG OSHEROFF, Stanford University — It is seldom the case that one can anticipate where great breakthroughs in science will occur, and even harder to anticipate where these breakthroughs will find applications to benefit mankind. In this talk the speaker will trace the development of NMR as an example of a development for which the applications were not at all obvious. He will then address the question of how discoveries in science occur, and will present a set of research strategies that can substantially increase the chances that one will make such a discovery. Finally, he will use his own discovery of superfluidity in liquid 3He to show how most discoveries depend essentially on contributions, often many, made by the progress of the scientific community at large.

Friday, October 19, 2007 10:40AM - 12:16PM –
Session B1 CM1: Condensed Matter Rudder Tower 401

10:40AM B1.00001 Bose-Einstein Condensate in solid helium[1] , SOULEYMANE DIALLO, HENRY GLYDE, University of Delaware — Neutron scattering measurements at high momentum and energy transfers, often referred to as deep inelastic neutron scattering (DINS), is the most effective tool to explore the dynamics of single particles in condensed matter. In liquid and solid helium for example, these measurements reveal the Bose-Einstein condensate (BEC) fraction and the average single-particle kinetic energy. In this talk, I will present recent DINS measurements of BEC in solid ^{4}He at temperatures below the reported 'supersolid' transition temperature of 200 mK. Within our current instrumental precision, we find that the BEC fraction, n_0, is consistent with zero.

10:52AM B1.00002 Molecular Production at a wide Feshbach resonance in Fermi-gas of cooled atoms , DEQIANG SUN, ARTEM ABANOV, VALERY POKROVSKY, Texas A&M University, POKROVSKY COLLABORATION — The problem of molecular production from degenerate gas of fermions at a wide Feshbach resonance, in a single-mode approximation, is reduced to the linear Landau-Zener problem for operators. The strong interaction leads to significant renormalization of the gap between adiabatic levels. In contrast to static problem the close vicinity of exact resonance does not play substantial role. Two main physical results of our theory is the high sensitivity of molecular production to the initial value of magnetic field and generation of a large BCS condensate distributed over a broad range of momenta in inverse process of the molecule dissociation.

11:04AM B1.00003 Quantum Vortex Dynamics in two-dimensional neutral superfuids[1] , CHENG-CHING WANG, University of Texas at Austin, REMBERT DUINE, Institute for Theoretical Physics at Utrecht University, ALLAN MACDONALD, University of Texas at Austin — We derive an effective action for the vortex translational zero modes of a superfluid by integrating out environmental modes which include phase and density fluctuations of the condensate. When the quantum dynamics of the fluctuations are treated as frozen with negligible Berry phases in adiabatic limit, we confirm the occurrence of vortex Magnus force and adiabatic vortex mass due to compressibility of the superfluids in agreement with earlier studies. We show that the adiabatic approximation is only valid in large system with small coherence length $R \gg \xi$. Furthermore, we also build a numerical model based on discrete Gross-Pitaevskii equation to show the renormalization and broadening of the vortex cyclotron resonance peaks. It is demonstrated that well-defined cyclotron peaks in spectral functions can be sustained only when the condition $R \gg \xi$ is satisfied. With the mapping between discrete Gross-Pitaevskii equation and bosonic single-band Hubbard model, we propose that the adiabatic vortex dynamics can be realized by tuning the ratio between tunneling energy J and on-site interaction energy U between atoms in cold atom systems with optical lattices such that $U \gg J$.

11:16AM B1.00004 The Fourier-Bessel Method , PATRICK NASH, University of Texas at San Antonio — Fourier split-step techniques are often used to compute soliton- like numerical solutions of the nonlinear Schrodinger equation. We discuss a new fourth-order implementation of the Fourier split-step algorithm for problems possessing azimuthal symmetry in 3+1-dimensions. This implementation is based, in part, on a finite difference approximation D=1/r d/dr 1/r that possesses an associated exact unitary representation of exp(i D) . The matrix elements of this unitary matrix are given by special functions known as the associated Bessel functions [Nash2004]. Hence the attribute Fourier-Bessel for the method. The Fourier- Bessel algorithm is shown to be unitary and unconditionally stable. The Fourier-Bessel algorithm is employed to simulate the propagation of a periodic series of short laser pulses through a nonlinear medium. This numerical simulation calculates waveform intensity profiles in a sequence of planes that are transverse to the general propagation direction, and labeled by the cylindrical coordinate z. These profiles exhibit a series of isolated pulses that are offset from the time origin by characteristic times, and provide evidence for a physical effect that may be loosely termed "normal mode condensation." Normal mode condensation is consistent with experimentally observed pulse filamentation into a packet of short bursts, which may occur as a result of short, intense irradiation of a medium.

11:28AM B1.00005 Continuous Neel to Bloch transition as thickness increases: statics and dynamics , KONSTANTIN ROMANOV, KIRILL RIVKIN, YURY ADAMOV, ARTEM ABANOV, WAYNE SASLOW, VALERY POKROVSKY, Texas A&M University — This work studies the magnetic behavior of infinitely long ferromagnetic strips. Two different kinds of domain walls parallel to the long direction can occur in this system: Neel domain wall and Bloch domain wall. In very thin strips the Neel domain wall is energetically favorable. However, as the strips thickness increases, the energy of the Neel wall rapidly grows and at some critical thickness its exceeds the energy of the Bloch domain wall. The nature of this transition is not well understood. We analyze this system with the help of numerical and analytical methods. We found that it exhibits a type-II phase transition. The ground states on both sides of the transition are analyzed. For thicker samples, above the transition an asymmetric Bloch wall appears, in a 2nd order phase transition.

11:40AM B1.00006 Comparisons of Different Particle-Chain Methods for Path Integral Monte Carlo Methods , TERRENCE REESE, Southern Unversity and A&M College, BRUCE MILLER, Texas Christian University — In previous work we have used Path Integral Monte Carlo methods to simulate a Positronium atom in a Lennard-Jones fluid. Trial positions are created for sub-chains of particles on the polymer chain to allow for proper exploration of the configuration space. Different methods can be used to determine how the different chains are selected. In this report we compare the results from simulations of Positronium in Xenon at 300 and 340K using our leap frog method and another method where the selection of the sub-chains for trial movements is done randomly. The results indicate that a random selection of sub-chains leads to more accurate simulation results at higher densities.

11:52AM B1.00007 Many-Body Density Matrix Perturbation Theory[1] , C.J. TYMCZAK, Texas Southern University, ANDERS NIKLASSON, Los Alamos National Laboratory — One fundamental limitation of quantum chemical methods is the accuracy of the approximate many-body theoretical framework that is utilized. Accurate many-body formalisms for quantum chemical methods do exist, but these methods are computationally very expensive. Methods also exist that are much less computationally expensive such as Hatree-Fock, Density Functional and the Hybrid Functional theories, but at a reduced representation of the exact many-body ground state. This severely limits either the system size that can be addressed accurately, or the accuracy of the representation of the many-body ground state. What is essential is a method which represents the many-body ground state accurately, but with a low computational cost. Recently, a method for determining the response, to any order of the perturbation, within the density matrix formalism has been discovered. This method is very simple and computationally efficient, and it immediately opens up the possibility of computing the variational many-body ground state to unprecedented accuracy within a simplified computational approach. Within this article, we report on the theoretical development of this methodology, which we refer to as Many Body Density Matrix Perturbation Theory.

12:04PM B1.00008 Statistical Mechanical Proof of the Second Law of Thermodynamics based on Volume Entropy , MICHELE CAMPISI, University of North Texas — As pointed out in [M. Campisi. Stud. Hist. Phil. M. P. 36 (2005) 275-290] the volume entropy (that is the logarithm of the volume of phase space enclosed by the constant energy hyper-surface) provides a good mechanical analogue of thermodynamic entropy because it satisfies the heat theorem and it is an adiabatic invariant. This property explains the "equal" sign in Clausius principle ($S_f \geq S_i$) in a purely mechanical way and suggests that the volume entropy might explain the "larger than" sign (i.e. the Law of Entropy Increase) if non adiabatic transformations were considered. Based on the principles of quantum mechanics here we prove that, provided the initial equilibrium satisfy the natural condition of decreasing ordering of probabilities, the expectation value of the volume entropy cannot decrease for arbitrary transformations performed by some external sources of work on a insulated system. This can be regarded as a rigorous quantum mechanical proof of the Second Law.

Friday, October 19, 2007 10:40AM - 12:28PM —
Session B2 AMO1: Atomic, Molecular and Optical Physics Rudder Tower 501

10:40AM B2.00001 Coherent Control of Trapped Bosons[1] , ANALABHA ROY, Graduate Student, Center for Complex Quantum Systems, University of Texas at Austin, LINDA REICHL, Director, Center for Complex Quantum Systems, University of Texas at Austin — We investigate the quantum behavior of a mesoscopic two-boson system produced by number-squeezing ultracold gases of alkali metal atoms. The quantum Poincare maps of the wavefunctions are affected by chaos in those regions of the phase space where the classical dynamics produces features that are comparable to $\hbar$. We also investigate the possibility for quantum control in the dynamics of excitations in these systems. Controlled excitations are mediated by pulsed signals that cause Stimulated Raman Adiabatic passage (STIRAP) from the ground state to a state of higher energy. The dynamics of this transition is affected by chaos caused by the pulses in certain regions of the phase space. A transition to chaos can thus provide a method of controlling STIRAP.

10:52AM B2.00002 Fluorescence Spectroscopy and Self-similar Expansion Studies in Ultracold Neutral Plasmas , JOSE CASTRO, HONG GAO, PRIYA GUPTA, SAMPAD LAHA, Rice University, CLAYTON SIMIEN, THOMAS KILLIAN, Rice University — Ultracold Neutral Plasmas (UNP's) are created by photoionizing laser-cooled atoms; the resulting plasma expands due to the thermal pressure of the electrons. Powerful optical diagnostics are available to study these systems where the initial density profiles, energies, and ionization states are accurately known and controllable. Fluorescence imaging of UNP's produces a spatially-resolved spectrum that is Doppler-broadened due to thermal ion velocity and shifted due to ion expansion velocity. Using this technique, measurements of the ion kinetic energy and plasma size show that the expansion is self-similar, following an analytic solution of the Vlasov equations, the central equations in the kinetic theory of plasmas.

11:04AM B2.00003 Coherent Slowing of a Pulsed Supersonic Beam with an Atomic Paddle , ISAAC CHAVEZ, EDVARDAS NAREVICIUS, Center for Nonlinear Dynamics, University of Texas at Austin, ADAM LIBSON, MAX RIEDEL, CHRISTIAN PARTHEY, Center for Nonlinear Dynamics, University of Texas at Austin, UZI EVEN, Sackler School of Chemistry, Tel-Aviv University, MARK RAIZEN, Center for Nonlinear Dynamics, University of Texas at Austin — We report the slowing of a supersonic beam by elastic reflection from a receding atomic mirror. Supersonic beams, formed by the adiabatic expansion of high pressure gas through an aperture, are currently the highest brightness sources available and have a high degree of monochromaticity. We use a pulsed supersonic nozzle to generate a 511 ± 9 m/s beam of helium that we slow by reflection from a Si(111)-H(1×1) crystal placed on the tip of a spinning rotor. We are able to continuously reduce the velocity of helium by 246 m/s and show that the temperature of the slowed beam is lower than 250 mK in the co-moving frame. We plan to use this beam as a probe for surface science studies and as the source for atom optics and interferometry experiments. The slow, cold, and intense nature of the beam should open new energy ranges and resolutions, allowing higher precision measurements.

11:16AM B2.00004 Fluctuations of Particle Number in Two-component Interacting Bose-Einstein Condensate. , ANDRII SIZHUK, ANATOLY SVIDZINSKY, MARLAN SCULLY, Physics Department MS 4242, Texas A&M University, TX 77843 USA — We study equilibrium fluctuations of particle number in the two-component weakly interacting Bose-Einstein condensate (BEC). Using Bogoliubov theory we obtain analytical expressions for the particle distribution function and fluctuations. We discuss several particular cases, namely, zero-temperature limit and the Thomas-Fermi regime. We study in detail the vicinity of the quantum phase separation transition where fluctuations undergo dramatic variation. We plot the temperature dependence of the first central moments of the condensate distribution function for the two-component interacting BEC and compare it with the one-component condensate.

11:28AM B2.00005 Single-Photon Atomic Cooling , TRAVIS BANNERMAN, GABRIEL PRICE, KIRSTEN VIERING, ED NAREVICIUS, MARK RAIZEN, Center for Nonlinear Dynamics and Department of Physics, The University of Texas at Austin — We report on a new method of laser cooling and phase space compression which does not rely on the momentum transfer between many photons and an atom. Whereas most laser cooling techniques (e.g. Doppler cooling, optical molasses, Raman cooling) require a cycling transition to allow for the scattering of many photons, our technique scatters on average only one photon from each atom. This is advantageous because the technique is not limited to the small subset of atoms in the periodic table which possess a cycling transition. The technique may potentially be extended to the cooling of polar molecules and atomic hydrogen.

11:40AM B2.00006 Optical Pumping in Ultracold Neutral Plasma. , HONG GAO, JOSE CASTRO, CLAYTON E. SIMIEN, SAMPAD LAHA, THOMAS C. KILLIAN, Rice University, Department of Physics and Astronomy, Houston, TX 77005 — We have studied the optical pumping by using fluorescence imaging in an ultracold neutral plasma (UNP). Velocity-changing collisions (VCC) have been observed during the optical pumping process. The collision causes the ions to quickly exchange momenta with their neighborhood and are optically pumped from ground state. We present our experimental data and discuss the VCC effect implications for laser cooling of a UNP.

11:52AM B2.00007 Phase Diagram of a Polarized Fermi Gas Across a Feshbach[1] , WENHUI LI, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston, TX 77251, USA, YEAN-AN LIAO, GUTHRIE B. PARTRIDGE, R.G. HULET, Department of Physics and Astronomy and Rice Quantum Institute, Rice University — We investigate a Fermi gas of ^{6}Li atoms with unbalanced populations in two spin states, whose interactions are tuned by a Feshbach resonance. At the unitarity limit, we observe three distinct phases connected by a tricritical point on a polarization vs. temperature (P-T) phase diagram: a phase-separated state at low T, a polarized superfluid and a polarized normal gas at higher T. We are currently mapping out the phase diagram as a function of P, T and interaction. At $T = 0$, as the interaction strength is tuned toward the BEC side of the resonance, we expect to encounter a phase boundary between the phase-separated state and the polarized superfluid. Conversely, on the BCS side, for finite P, a transition to the polarized normal gas is expected. We will present our latest results.

[1]Supported by NSF, ONR, and The Welch and Keck Foundations.

12:04PM B2.00008 Pulsed Magnetic Slowing of Atoms and Molecules , CHRISTIAN G. PARTHEY, EDVARDAS NAREVICIUS, ADAM LIBSON, JULIA NAREVICIUS, ISAAC CHAVEZ, Center for Nonlinear Dynamics and Department of Physics, The University of Texas at Austin, UZI EVEN, Sackler School of Chemistry, Tel-Aviv University, MARK G. RAIZEN, Center for Nonlinear Dynamics and Department of Physics, The University of Texas at Austin — Supersonic beams are a high brightness source of atoms and molecules. Although the atoms' temperature in the co-moving frame is in the sub-kelvin range their velocity is on the order of several hundreds of meters per second. We report the experimental demonstration of a novel method to slow atoms and molecules with permanent magnetic moments using pulsed magnetic fields. The method is suitable for most atoms since most elements are paramagnetic, and can also be applied to certain molecules as well as electronically excited metastable states. We show the feasibility of this technique by slowing a supersonic beam of metastable neon from (461.0 ± 7.7) m/s to (403 ± 16) m/s in 18 stages.

12:16PM B2.00009 Quantum Contextuality and Einsteinian Realism , BRIAN LA COUR, University of Texas at Austin — Contextuality is a phenomenon predicted to be exhibited by quantum systems and at variance with Einsteinian realism, which is said to be noncontextual. The Kochen-Specker theorem, and its many variants, purports to prove this inconsistency. Recently, the question has been put to experiment [e.g., Hasegawa et al., PRL 97, 230401 (2006)], and the findings are consistent with quantum theoretic predictions. I will argue that, in fact, there is no such inconsistency. Specifically, a proof is offered which demonstrates that quantum mechanics is consistent with a noncontextual hidden variable theory, thus refuting the Kochen-Specker theorem. (For simplicity, the proof is restricted to a four-dimensional Hilbert space but is expected to generalize.) The key to the proof is the recognition of a subtle but fundamentally important assumption regarding the dependence of the hidden variable probability distribution on the particular set of mutually commuting observables chosen for measurement.

Friday, October 19, 2007 10:40AM - 12:16PM –
Session B3 HEN1: High Energy/Nuclear Rudder Tower 701

10:40AM B3.00001 Comparing Methods for Multivariate Classifier Training Variable Selection using the Search for the Scalar Top Quark as a Case Study. , DENNIS MACKIN, Rice University, DØ COLLABORATION — We look for a way to automate the process of training variable selection when applying multivariate event classifiers to the search for new phenomenon in high energy physics experiments. The DØ collaboration recently completed a search for the Supersymmetric partner of the top quark in the two muons, two jets, and missing transverse energy final state. We use the Monte Carlo events representing the signal and the background from this search as the basis for our case study. We begin with the computationally expensive, $\mathcal{O}(2^n)$, method of testing the classifier for all variable combinations and then selecting the one combination which gives the best expected signal sensitivity. We then compare this "best" sensitivity to the sensitivities of the classifier when trained using variable combinations suggested by less expensive methods such as sequential forward selection, chi-squared and K-S testing, and physicist intuition. Even in this age of grid computing, the total number of variables which can be tested is limited. In our case, we were limited to considering eleven variables. A less expensive method of variable selection would not only free up computing resources, it would enable us to consider a much larger set of variables for use in the multivariate classifier.

10:52AM B3.00002 Searches for a Dark Matter Candidate in Particle Physics Experiments at the Fermilab Tevatron , PAUL GEFFERT, MAX GONCHAROV, EUNSIN LEE, RISHI PATEL, DAVID TOBACK, PETER WAGNER, VYACHESLAV KRUTELYOV, CDF COLLABORATION — Astronomical observations have shown that the amount of visible matter in the universe comprises only a fraction of the total mass of the current universe. Models of Supersymmetry can account for this mass by predicting new particles. We present a search for these particles in proton anti-proton collisions at the Fermilab Tevatron using a new timing device on the Collider Detector at Fermilab and discuss prospects for future searches into the cosmologically favored region of parameter space for models with heavy, long-lived neutralinos that decay into photons and gravitinos.

11:04AM B3.00003 Probing 23% of the Universe at the Large Hadron Collider , ALFREDO GURROLA, RICHARD ARNOWITT, BHASKAR DUTTA, TERUKI KAMON, ABRAM KRISLOCK, DAVE TOBACK, Texas A&M University — With recent astronomical measurements, we know that 23% of the Universe is accounted by a mysterious dark matter. The results have constrained the parameter space of supersymmetry (SUSY), which is a leading theory that could connect cosmology and particle physics and offers an explanation of the dark matter. A characteristic prediction from the parameter space is that the supersymmetric tau lepton and the lightest neutralino are nearly mass degenerate (mass difference of $\sim$ 5-15 GeV) and can be created at the Large Hadron Collider (LHC). We present a methodology to extracting the dark matter signals at the LHC, and show the accuracy to which we can measure the dark matter relic density and the SUSY parameters.

11:16AM B3.00004 Dark Matter Relic Density and Supersymmetry at the LHC , JONATHAN ASAADI, Texas A&M University — The theory of Supersymmetry (SUSY) could provide a fundamental link between early Big Bang cosmology and particle physics by providing a possible explanation to the origin and abundances of the Dark Matter. WMAP measurements, in addition to other experimental results, help constrain the SUSY parameter space to a region known as the co-annihilation region where the stau and the neutralino (LSP) are nearly the same mass (mass difference $\sim$ 5-15GeV). We present one approach to extracting information about the Dark Matter candidate at the LHC in addition to the different parameters of the minimal Supergravity (mSUGRA) model of SUSY.

11:28AM B3.00005 Heavy-Quark diffusion in the Quark-Gluon Plasma , HENDRIK VAN HEES, Texas A&M University, College Station, Texas, MASSIMO MANNARELLI, Instituto de Ciencias del Espacio, Bellaterra (Barcelona), Spain, VINCENZO GRECO, Dipartimento di Fisica e Astronomia, Catania, Italy, RALF RAPP, Cyclotron Institute and Physics Department, Texas A&M University, College Station, Texas — The Quark-Gluon Plasma (QGP) is a hot and dense state of matter predicted by Quantum Chromo Dynamics (QCD) to exist at temperatures above T 200MeV ($\sim 10^{12}$ Kelvin). The QGP is believed to have prevailed in the first few microseconds after the big bang. Experiments at the Relativistic Heavy Ion Collider (RHIC) are trying to recreate, for a short moment, the QGP in the laboratory. It has been found that the matter produced in high-energy Au-Au collisions is a strongly coupled quark-gluon liquid with very low viscosity and high opacity. To understand the properties of this strongly coupled QGP (sQGP) heavy quarks (charm and bottom) are a particularly valuable probe: they are produced early in the reaction and subsequently diffuse in the putative sQGP. In this talk we develop a model for nonperturbative interactions between heavy and light quarks in the sQGP and apply it to experimental spectra at RHIC. Good agreement with data allows for a quantitative estimate of the heavy-quark diffusion coefficient in the sQGP.

11:40AM B3.00006 Transverse-momentum dependence of J/ψ suppression in heavy-ion collisions[1] , XINGBO ZHAO, RALF RAPP, Texas A&M University — A central goal of heavy-ion collisions at high energies is the production of the Quark-Gluon Plasma (QGP), a new state of matter in which quarks and gluons are deconfined. A promising signature of deconfinement in these collsions may be a suppression of J/ψ particles, due to the Debye screening of the strong force in the QGP. However, recent theoretical developments suggest that J/ψ mesons can be regenerated via recombination of charm and anti-charm quarks in the QGP. To disentangle these mechanisms, we perform a systematic study of J/ψ-formation processes and investigate J/ψ transverse-momentum distributions in heavy-ion collisions at different energies (at the SPS at CERN and at the Relativistic Heavy-Ion Collider at Brookhaven). We employ a two-component model to compare J/ψ p_t distributions to experimental data.

[1]supported by NSF

11:52AM B3.00007 Systematic Statistical Study of NAHE Based String Models , TIM RENNER, Baylor University, JARED GREENWALD, Brigham Young University, GERALD CLEAVER, Baylor University — We are conducting a systematic study of the phenomenological properties of models on the region of the string landscape occupied by weak coupled heterotic strings in the free fermionic formalism. Specifically, we are examining the statistics of phenomenological properties, including of the superpotential, of the collection of models formed as extensions of the Nanopoulos, Antoniadis, Hagelin, and Ellis (NAHE) set of free fermionic basis vectors. The NAHE he observable gauge group is SO(10) with N=1 supersymmetry. We systematically generate all possible sets of free fermionic basis vector extensions to the NAHE set that reduce the SO(10) model to Flipped SU(5) models, Left-Right Symmetric (Pati-Salam-like) models, and MSSM-like models. (Several of such models have been constructed and studied individually by various research groups in the past.) All possible order-2 through order-4 basis vector extensions consistent with SO(10) breaking and modular invariance were constructed as part of a 2007 REU summer project with graduate students at Baylor University. Systematic generation and statistics collection of the related models has begun. Generation of additional higher order basis vector extensions is in process.

12:04PM B3.00008 Heterotic Strings on Mirror Half-Flat Manifolds , TIBRA ALI, GERALD CLEAVER, Baylor University — In this talk we report on progress made in the study of $E_8 \times E_8$ heterotic string theory on mirror half-flat manifolds. We are motivated to study this system because mirror half-flat manifolds offer a way to fix some of the moduli of heterotic string theory on Calabi-Yau manifolds. We argue that the analogue of standard embedding in the half-flat case is to embed the natural torsionful connection into the gauge connection. The surviving subgroup is still $E_6 \times E_8$ as in Calabi-Yau compactification. We show this by thinking of the heterotic string on a half-flat manifold as a "reduction" of $R^{1,2} \times Z_7$, where Z_7 is non-compact G_2 holonomy cylinder foliated by compact mirror half-flat leaves. We then report progress on working out the effective action of heterotic string theory on these manifolds.

Friday, October 19, 2007 10:40AM - 12:16PM —
Session B4 AS1: Astrophysics, Space Physics, Astronomy and Cosmology Rudder Tower 510

10:40AM B4.00001 Testing a New Method of Detecting RR Lyrae Variable Stars , W. LEE POWELL JR., RONALD WILHELM, GWEN ARMSTRONG, STEPHEN TORRENCE, Texas Tech University — Our group has submitted two papers for publication describing a new method of detecting RR Lyrae variable stars using only a single epoch of both photometry and spectroscopy taken from the Sloan Digital Sky Survey (SDSS). The method takes advantage of clear departures from the template norm for stars that have photometry and spectroscopy taken out of phase. This paper describes observations taken at McDonald Observatory to test the method's accuracy. I will discuss how and why the method works, our McDonald observations, and some statistical methods for determining the variability of stars that lack complete light curves.

10:52AM B4.00002 Investigation of Element Processing in the Crab Nebula , TIM SATTERFIELD, GORDON MACALPINE, Trinity University — Heavy elements are manufactured in stars. In particular, exploding stars are very effective at distributing heavy nuclei into the interstellar medium, where they may form into new stars, planets, and life. Young supernova remnants can provide our best means for detailed studies of how elements are processed in stars before, during, and after the explosions. The Crab Nebula, the remnant of a supernova observed from Earth in 1054, is ideal for this type of investigation. We are using a numerical photoionization code to analyze the physical and chemical properties at different locations of the Crab Nebula's gaseous debris field. Results of calculations are compared with optical and infrared spectrum measurements in order to understand chemical abundances and the range of nuclear processing. It is found that some gas has apparently not been processed significantly beyond the CNO-cycle, whereby roughly 90% of the material is helium by mass fraction. In addition, much of the nebula has undergone partial helium-burning, leading to a large increase in the amount of carbon, along with conversion of nitrogen into neon. Furthermore, regions with significantly increased products of oxygen-burning can be effectively modeled; and extremely high apparent concentrations of nickel contain mixtures of elements consistent with the recent suggestion that winds may carry iron-peak nuclei away from the surface of the young neutron star in the Crab Nebula.

11:04AM B4.00003 VI CCD Photometry of the Old Open Clusters IC 361 and Berkeley 78. , AMY JONES, Graduate Student, RANDY PHELPS, Director of Education for NSF — Open clusters are important test particles for probing the formation and evolution of the Milky Way disk. We have undertaken VI CCD photometry of the poorly studied open clusters IC 361 and Berkeley 78. Ages, reddenings [E(V-I)], Heliocentric distances [d], apparent distance moduli [(m-M)v], true distance moduli [(m-M)o], Galactocentric radii [R_{GC}], and vertical distances for the plane [z] for these clusters have been determined using the Girardi et al.(2002, A&A, 391, 195) isochrones.

11:16AM B4.00004 Untangling the M Cloud Within the Local Supercluster , MIKE FANELLI, Texas Chrisitan University, LINDSAY ANDERSON, University of North Dakota — The Local Supercluster (LSC) contains a number of galaxy groups with varying morphological content. Untangling the three dimensional structure of the LSC requires accurate distance measures to in individual galaxies. Distance assessments are greatly complicated by the effects of the Virgo Cluster, the dynamical center of the LSC, which perturbs the Hubble flow, introducing uncertainties in distance estimates. Discerning the content of the Virgo Cluster itself is affected; background galaxies projected onto the cluster cannot easily be distinguished from cluster members. We have analyzed the content of the M cloud, a galaxy group located on the periphery of the Virgo Cluster, using new data from the Sloan Survey and modern distance estimators. The M Cloud contains ∼30 galaxies, located at approximately twice the distance to Virgo.

11:28AM B4.00005 A Search for Parsec-scale Radio Jets in Faint Quasar and Radio Galaxy Nuclei[1] , DAVID HOUGH, Trinity University, CHRISTIAN AARS, Angelo State University — Parsec-scale radio jets in bright active galaxy nuclei have been well-studied, but they are generally directed toward Earth. To test relativistic jet models over a wide range in orientation, we are studying nuclei 10-1000 times weaker. Observations of four very faint nuclei in classical doubles were made at 8.4 GHz in December 2004 and March 2006 using the High Sensitivity Array (HSA). The radio galaxy 3C132 has a 5- mJy elliptical structure, but it is not clear if this might represent a one- or two-sided jet. The radio galaxy 3C34 shows a 1.5-mJy circular core with no jet. The radio galaxy 3C441 was not detected (< 1 mJy). The quasar 3C68.1 has a 1.2-mJy circular core with no jet. Thus, despite the HSA's extreme sensitivity, we have not made a clear detection of a single jet. This is somewhat surprising based on an extrapolation of a known core-jet brightness correlation to fainter nuclei, but core and jet Lorentz factors of 5-10 could explain the missing jets if a substantial fraction of the core emission is unbeamed at large orientation angles.

11:40AM B4.00006 Simulations of the Cleft Ion Fountain outflows resulting from the passage of Storm Enhanced Density (SED) plasma flux tubes through the dayside cleft auroral processes region[1] , JAMES HORWITZ, WEN ZENG, Department of Physics, The University of Texas at Arlington, Arlington, TX 76019 — Foster et al. [2002] reported elevated ionospheric density regions convected from subauroral plasmaspheric regions toward noon, in association with convection of plasmaspheric tails. These Storm Enhanced Density (SED) regions could supply cleft ion fountain outflows. Here, we will utilize our Dynamic Fluid Kinetic (DyFK) model to simulate the entry of a high-density "plasmasphere-like" flux tube entering the cleft region and subjected to an episode of wave-driven transverse ion heating. It is found that the O^+ ion density at higher altitudes increases and the density at lower altitudes decreases, following this heating episode, indicating increased fluxes of O^+ ions from the ionospheric source gain sufficient energy to reach higher altitudes after the effects of transverse wave heating. Foster, J. C., P. J. Erickson, A. J. Coster, J. Goldstein, and F. J. Rich, Ionospheric signatures of plasmaspheric tails, *Geophys. Res. Lett.*, 29(13), 1623, doi:10.1029/2002GL015067, 2002.

11:52AM B4.00007 Compact representations of high-latitude ionospheric outflows[1] , JAMES HORWITZ, WEN ZENG, Department of Physics, The University of Texas at Arlington, Arlington, TX 76019 — Realistic compact representations of the ionospheric outflow bulk parameters and their relationships to putative drivers are needed for global magnetospheric modeling. Recent satellite data analyses have obtained formula fits for the measurement-based relationships of the outflows levels to parameterizations for electron precipitation and Poynting fluxes, which are expected to be among the principal drivers for the ionospheric outflows. Here, an extensive set of systematic simulation runs with our Dynamic Fluid Kinetic (DyFK) simulation code for ionospheric plasma field-aligned transport is employed to obtain O^+ and H^+ densities and flow velocities at altitudes corresponding to typical inner boundary levels for prominent current global magnetospheric models. These O^+ and H^+ densities and parallel flow velocities are represented versus parameterizations for precipitation electrons, the BBELF waves which transversely heat ionospheric ions, and solar zenith angle.

12:04PM B4.00008 Formation of O^+ trough zones in the polar cap ionosphere-magnetosphere coupling region: Dynamic Fluid-Kinetic Simulations[1] , JAMES HORWITZ, WEN ZENG, FAJER JAAFARI, Department of Physics, The University of Texas at Arlington, Arlington, TX 76019 — Thermal ion measurements by the Thermal Ion Dynamics Experiment(TIDE) on the POLAR spacecraft show that the O^+ densities in the polar cap near 6000 km altitude display structured variations featuring low-density trough regions. For this presentation, the UT Arlington Dynamic Fluid-Kinetic (DyFK) model is utilized to investigate such O^+ density profiles. Using available measured solar wind parameters to drive a time-varying high-latitude convection model and incorporating auroral processes of soft electron precipitation and wave-driven ion heating, we simulate the evolving high-latitude ionospheric plasma transport and associated parameter profiles for several convecting flux tubes in the high-latitude ionosphere-magnetosphere system. The modeled densities near 6000 km altitudes are compared with multiple trough events featuring POLAR/TIDE-measured O^+ densities for inside and outside of such trough regions.

Friday, October 19, 2007 10:40AM - 12:04PM —
Session B5 GEN1: Biological, Chemical and General Physics Rudder Tower 504

10:40AM B5.00001 A Swept Wavelength Optical Resonant Raman Detector (SWOrRD) for Bio-detection. , CHARLES MANKA, Research Support Instruments, Lanham, MD, JACOB GRUN, Naval Research Laboratory, Washington, DC, DAN ZABETAKIS, NRL-DC, SERGEI NIKITIN, GELU COMANESCU, RSI, JEFF BOWLES, DAVID GILLIS, NRL-DC — A new device that sequentially illuminates bacteria with different ultraviolet wavelengths and obtains a spectrum at each wavelength has been developed and tested. The available wavelengths are spaced at ~ 0.3 nm intervals from 210 to 280 nm. Tuning from one wavelength to another requires 20 to 60 seconds, depending on the wavelength region. Liquid samples are contained in a quartz cuvette, illuminated side-on and the scattered light is collected at 90 degrees. A double spectrograph and CCD camera record the resulting Raman Spectra. Spectra from the sequential illumination are assembled into a data "cube" for processing and analysis. Measurements of two-dimensional resonant-Raman spectra of bacteria are presented and the applicability of the method for the identification of bacteria, including differentiation of genetically similar species, is demonstrated. We anticipate that information within such two-dimensional spectra will allow identification of bacteria, as well as chemicals, in complex environments containing multiple organisms and chemicals. This device may lead to instruments that rapidly identify bacteria in hospital and food process settings, for screening large populations, and for biochemical-threat warning systems.

10:52AM B5.00002 Towards Single-Shot Detection of Bacterial Endospores via Coherent Raman Spectroscopy[1] , DMITRY PESTOV, XI WANG, GOMBOJAV ARIUNBOLD, ROBERT MURAWSKI, VLADIMIR SAUTENKOV, ALEXEI SOKOLOV, MARLAN SCULLY, Texas A&M Univ. — Recent advances in coherent anti-Stokes Raman scattering (CARS) spectroscopy hold exciting promise to make the most out of now readily available ultrafast laser sources. Techniques have been devised to mitigate the nonresonant four-wave-mixing in favor of informative Raman-resonant signal. In particular, a hybrid technique for CARS (see *Science* **316**, 265 (2007)) brings together the advantages of coherent broadband pump-Stokes excitation of molecular vibrations and their time-delayed but frequency-resolved probing via a spectrally narrowed and shaped laser pulse. We apply this technique to the problem of real-time detection of warfare bioagents and report single-shot acquisition of a distinct CARS spectrum from a small volume of *B. subtilis* endospores ($\sim 10^4$ spores), a harmless surrogate for *B. anthracis*. We study the dependence of the CARS signal on the energy of the ultrashort preparation pulses and find the limit on the pulse energy fluence (~ 0.2 J/cm^2), imposed by the laser-induced damage of the spores.

11:04AM B5.00003 Microfabricated Devices for Control of Electric and Magnetic Fields on Cellular Length Scales[1] , DANIEL STARK, LAURA TIMMERMAN, LISA BISWAL, ROBERT RAPHAEL, THOMAS KILLIAN, Rice University — Microfabrication techniques, such as photolithography and electroplating, are increasingly being used to create tools that, in combination with biological imaging, probe the physics of biological systems. With these devices one can exert control over electric and magnetic fields at the cellular length scale. We present here the design and development of two microscale devices. These devices can be used as magnetic micromanipulators that apply piconewtons of force to cells or as stimulators that apply electrical fields up kV/cm. Additionally, these devices can be utilized to probe cell membrane mechanics or to deliver genetic material to individual cells by electroporation.

11:16AM B5.00004 Vibratonal Spectra and DFT calculations of dipicolinic acid and its calcium salt[1] , KATHLEEN MCCANN, JAAN LAANE, Texas A&M University, College Station, Texas — The infrared and Raman spectra of dipicolinic acid (DPA) and calcium dipicolinate have been recorded in the solid phase and their vibrations have been assigned. DFT calculations using B3LYP/6-311++G** have been used to calculate the spectra of the free dipicolinic acid molecule and its ion in an environment free of intermolecular interactions. Calculations have also been carried out to better understand the effects of intermolecular hydrogen bonding and the interactions between water and DPA. The calculated frequencies agree well with the experimental values after scaling.

11:28AM B5.00005 Surface Engineering for Microtubule Manipulation[1] , JOHN NOEL, WINFRIED TEIZER, Dept. of Physics, Texas A&M Univ., WONMUK HWANG, Dept. of Biomedical Engineering, Texas A&M Univ. — Microtubule filaments act as dynamic structures inside cells for cargo transport and cell motility. We have used self-assembled monolayers and lithographic techniques to control surface interactions between microtubules and synthetic substrates. Switchable protein adsorption has been achieved using an electrode coated with a non-fouling polyethylene glycol self-assembled silane monolayer (SAM). Novel integration of the SAM into current electron-beam lithography techniques has allowed for the underlying electrode to be patterned with much freedom of geometry while preventing permanent adsorption of the protein. In this configuration, microtubules assemble on top of the patterned electrode but are blocked from the surrounding regions. The reversible adsorption permits study of microtubules under spatially controlled electric fields. Furthermore, such active test surfaces can be used to study microtubule assembly and to simulate kinesin motor transport in neurons. This method is also compatible with DNA and other biomolecules and, unlike soft lithography, can be scaled down to tens of nanometers in a straightforward manner.

11:40AM B5.00006 Conformation transition of betaA in solution and on surface of lipid bilayer , LIMING QIU, ANDREW REAY, QING ZHU, MARK VAUGHN, KWAN CHENG — Beta amyloid (betaA) is a 39 to 43 residue peptide generated by a proteolytic cleavage of a large transmembrane amyloid precursor protein in neuronal membranes. The misfolding and self-aggregation of betaA, as well as its interactions with neuronal membranes, have been linked to the early onset of pathogenesis of Alzheimer disease. The secondary structure conformational transition of betaA from an alpha-helix to beta-sheet in some key regions of the peptide represents an important signature of the complex misfolding behavior of betaA. Using all-atom molecular dynamics simulations, the conformation changes of betaA in solution and on the surface of lipid bilayer containing nanodomains of cholesterol have been studied. Our results indicated that the appearance of beta-sheet structures depends strong on the initial structures of betaA and the arrangement of cholesterol molecules in the lipid bilayer.

11:52AM B5.00007 Emergence of Alpha and Gamma Like Rhythms in a Large Scale Simulation of Interacting Neurons[1] , PHILIPP GAEBLER[2], Harvey Mudd College, BRUCE MILLER, Texas Christian University — In the normal brain, at first glance the electrical activity appears very random. However, certain frequencies emerge during specific stages of sleep or between quiet wake states. This raises the question of whether current mathematical and computational models of interacting neurons can display similar behavior. A recent model developed by Eugene Izhikevich appears to succeed. However, early dynamical simulations used to detect these patterns were possibly compromised by an over-simplified initial condition and evolution algorithm. Utilizing the same model, but a more robust algorithm, here we present our initial results, showing that these patterns persist under a wide range of initial conditions. We employ spectral analysis of the firing patterns of a system of interacting excitatory and inhibitory neurons to demonstrate a bimodal spectrum centered on two frequencies in the range characteristic of alpha and gamma rhythms in the human brain.

[2]Summer participant in REU program 2006-7 at Texas Christian University

10:40AM - 10:40AM —
Session B6 P1: Poster Session I: Condensed Matter and Atomic, Molecular, and Optical MSC 292

B6.00001 Optical Techniques for the Measurement of Nanoscale Hydrogel Crystal Particles[1] , PRESTON KENDALL, CHENGLIN CHI, WELLS ESTABROOK, TONG CAI, ZHIBING HU, Sewanee: The University of the South — Two optical techniques can be used to measure the size of the hydrogel component particles at the nano scale: 1) a method using light absorbance and 2) a method using laser light diffraction. Both methods have advantages and disadvantages. The laser light diffraction method is effective for particles ranging from 400 nm to 1000 nm in diameter while the UV absorbance method is effective for particles ranging from 100 nm to 400 nm in diameter.

B6.00002 Optical Characterization of the Ho^{3+} Complex in HEMA[1] , MANUEL RODRIGUEZ III, DHIRAJ SARDAR, KELLY NASH, RAYLON YOW, JOHN GRUBER, University of Texas at San Antonio — The spectroscopic properties of the Ho^{3+} complex embedded in 2-hydroxyethyl methacrylate (HEMA) are investigated. The intensities of the room temperature absorption spectra of the $Ho^{3+}(4f^{10})$ transitions in $Ho(NO_3)_3.5H_2O$:HEMA have been analyzed using the Judd-Ofelt (J-O) model to obtain the phenomenological intensity parameters, Ω_2, Ω_4, and Ω_6. These parameters are used to calculate the spontaneous emission probabilities, radiative lifetimes, and branching ratios of the Ho^{3+} transitions from the upper multiplet manifolds to the corresponding lower-lying multiplet manifolds of $^{2S+1}L_J$ $Ho^{3+}(4f^{10})$, which include $^5G_4+^3K_7^{(2)}$, $^5G_5$, $^5G_6+^5F_1$, $^5F_2+^3K_8^{(2)}$, $^5F_3$, $^5F_4+^5S_2$, and $^5F_5$. The predicted room temperature fluorescence lifetime of $^5I_7$ to $^5I_8$ is about 0.5 ms, suggesting a reasonably strong interaction between the complex and the polymer. A comparative study of $Ho^{3+}(4f^{10})$ ions in different host materials suggests that $Ho(NO_3)_3.5H_2O$:HEMA could be an excellent candidate for certain applications such as narrow band pass filters, especially in the visible-to-near infrared region of the spectrum.

B6.00003 Effects of Sintering Temperature on Superconductivity in undoped and SiC-doped MgB_2/Ti Wires , CAD HOYT, HUI FANG, JOHN DOUGLAS, K. WEST, GAN LIANG, Sam Houston State University, SAMARESH GUCHHAIT, JOHN MARKERT, University of Texas at Austin — The effects of sintering temperature on the superconducting properties of both undoped and SiC-doped MgB_2 wires have been studied. The wires were fabricated by in situ powder-in-tube (PIT) method and characterized by x-ray diffraction, magnetization, scanning electron microscopy, and electrical resistivity measurements. Two groups of wire samples were prepared: the first group contains a pure MgB_2 core and the second contains MgB_2 core doped with 10 wt.% of 20 nm SiC. Both groups of samples were sintered for 30 minutes at the following temperatures: 650 ˚C, 700 ˚C, 750 ˚C, 800˚C, 850˚C. It was found that the cores of these wires are almost in pure MgB_2 superconducting phase and the superconducting transition temperatures of the wires are about 36 K. For both groups of samples, the critical current density (J_c), measured at 5 K and 20 K in fields up to 7 Tesla, peaks up at sintering temperature 800˚C. This result is in sharp contrast with recent results observed for Fe-sheathed wires for which the maximum J_c was achieved at lower sintering temperatures. Detail discussion will be given to explain such dependence of J_c on the sintering temperature.

B6.00004 Spectroscopic and thermal studies of amino acid doped Potassium Dihydrogen Phosphate crystals , JAYESH GOVANI, Physics Department, University of Texas at El Paso, El Paso, TX 79912, USA, MIHIR JOSHI, DIPAK DAVE, KETAN PARIKH, Physics Department, Saurashtra University, Rajkot, Gujarat 360 005, India , FELICIA MANCIU, Physics Department, University of Texas at El Paso, El Paso, TX 79912, USA — Potassium dihydrogen phosphate-based materials (KDP) are extensively used for non-linear optical applications. The samples for the current studies were prepared in 8 to 10 days by slow evaporation solution growth technique. Thermal gravimetric analysis of L-histidine amino acid doped KDP crystals demonstrate that the decomposition of the sample occurred at slightly lower temperatures with increasing doping amount. The powder X-ray diffraction patterns reveal a single phase nature with the unit cell parameters being unaltered by doping. Although the main bands observed in the infrared absorption spectra correspond to KDP crystals, the existence of vibrational lines at 1634 cm^{-1}, 1714 cm^{-1}, 2854 cm^{-1}, and 2923 cm^{-1}, which are attributed to the degenerate deformations of NH_3+ groups and of unprotonated monoclinic L-histidine ring, demonstrate that successful doping was achieved. This affirmation is supported with more evidences from FT-Raman measurements.

B6.00005 Effects of Gasses on the Thermal Etching Properties of Graphene Nanoribbons , JASON JONES, PHILLIP ECTON, YUDONG MO, BRIAN GORMAN, DAVID DIERCKS, THOMAS SCHARF, JOSE PEREZ, DEPARTMENT OF PHYSICS, UNIVERSITY OF NORTH TEXAS COLLABORATION, DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING, UNIVERSITY OF NORTH TEXAS COLLABORATION — We investigate the rates of thermal etching for different thicknesses of graphene nanoribbons exposed to different gasses. Etching rates are determined by comparing the change in width of the ribbons to etching time. The thickness and width of the graphene nanoribbons are precisely measured using Atomic Fore Microscopy (AFM). We synthesize sheets of graphene by exfoliating Highly Ordered Pyrolytic Graphite (HOPG) onto a silicon substrate. Optical identification of the scattered graphene sheets is optimized by using a silicon substrate shielded with a 300nm thermal oxide layer, giving the substrate a deep blue color. Verification of monoatomic graphene is accomplished by Raman imaging. Graphene sheets are cut into ribbons using a Focused Ion Beam (FIB). Using FIB techniques, ribbons on the order of 50 to 100 nanometers are produced. The nanoribbons are placed in a furnace combined with a rough vacuum. The graphene nanoribbons are etched by exposure to oxygen gas at a pressure of 300 millitorr for 15 minutes at 650 degrees Celsius. We studied the effects of different gasses on the etching properties of the nanoribbons.

B6.00006 Spectroscopic studies of particulate formation in fuel blends , FELICIA MANCIU, Physics Department, MAHESH SUBRAMANYA, Combustion, Propulsion and Reaction Engineering Laboratory, Department of Mechanical and Industrial Engineering, JAYESH GOVANI, Physics Department, AHSAN CHOUDHURI, Combustion, Propulsion and Reaction Engineering Laboratory, Department of Mechanical and Industrial Engineering, University of Texas at El Paso — The Raman and infrared absorption spectroscopy were used to investigate the properties of carbon nanotubes (CNTs) flame-synthesized using CH_4-H_2 low calorific value gases. The development of large amounts of CNTs benefits from flame synthesis processes, where the fuel serves as both the heating and the reactant source. As a result of flame condition studies it was determined that the CNT growth region is at 20-30% of the visible flame height and at a flow rate between 7.18E-07 m^3/s and 9.57E-07 m^3/s. Preliminary characterizations of the samples by Scanning Electron Microscopy demonstrate that the formation of nanostructure occurs only for <10% H_2 concentration. The Raman analysis of the pristine samples shows the existence of distinctive multi-walled carbon nanotube (MWNT) D and G bands at 1321 cm^{-1} and 1595 cm^{-1}, respectively. Besides the vibrational lines characteristic to MWNTs, infrared absorption measurements also reveal the presence of C-H bonds.

B6.00007 Ion Beam Analysis of Thin Films on Silicon and Carbon Substrates[1] , PELHAM KEAHEY, J'NAE ZWASCHKA, LUCAS PHINNEY, LEE MITCHELL, KHALID HOSSIAN, JEROME DUGGAN, University of North Texas — Economics is the primary driving force behind the semiconductor industry's quest to make devices smaller and smaller. Such devices as transistors and integrated chips are produced by laying down very thin films of various materials, insulators and conductors, and masking them in such a way to produced the device. Ion Beam Analysis techniques, such as Rutherford Back Scattering (RBS) is commonly used to calculate the thickness of these layers and their integrity. To illustrate this type of analysis Aluminum, Copper and Gold were evaporated onto ultra pure Carbon and Silicon sheets (Figure 1). Using a 2.5MeV VandeGraff accelerator we use RBS with both a proton and alpha particle beam which impinged on the sample in an ultra high vacuum chamber (fig 2). From the data collected from RBS, we used two mathematical techniques and one simulation program to fit the experimental data. Mathematical methods include :1) Using known Rutherford cross section and experimental data 2) Comparing measured peaks to high precision standards. We used the simulation program (SIMNRA) to model the experimental results as shown in the following graphs.

[1]National Science Foundation Research for Undergraduates.

B6.00008 Growth and Characterization of Wide Band Gap Semiconductors (Zinc Oxide, Zinc Sulfide)[1] , JEFFREY SCHWARTZ, University of Texas at Dallas, JOSE PEREZ, YUDONG MO, University of North Texas — Zinc Oxide and Zinc Sulfide nanostructures were grown on a variety of substrates using aqueous growth solutions. The chemical composition of the nanostructures was characterized using micro-Raman spectroscopy, energy-dispersive X-Ray spectroscopy, and X-Ray diffraction. A Scanning Electron Microscope reveals a well-aligned, uniform, layer of hexagonally shaped Zinc Oxide nanorods growing up perpendicular to the substrate surface while the Zinc Sulfide formed irregularly shaped spheres on the substrate. Depending on the growth conditions, the diameters of the ZnO nanorods ranged from a few hundred nanometers to about 1 μm. The field emission properties of the ZnO nanorods and the ZnS spheroids were studied, with turn-on voltages found to be around 36 v / μm, as well as the effects on ZnS after exposure to various gases which was found to increase the turn-on voltage in most cases.

[1]Work supported by a grant from the National Science Foundation through the Research Experience for Undergraduates program

B6.00009 Thioindigo Interaction with Palygorskite and Sepiolite , ALEJANDRA RAMIREZ, RUSSELL CHIANELLI, University of Texas at El Paso, SRIDHAR KOMARNENI, The Pennsylvania State University, SWATI KUMAR, University of Texas at El Paso, ORGANIC-INORGANIC MATERIALS COLLABORATION — Pigments developed by the Mayan civilization are now known to be significantly 'environmentally friendly' a technical skill developed circa 250-900 C.E! [1]. One such pigment called Maya Blue, has been the focus of numerous studies and is believed to be a mixture of palygorskite clay and indigo dye [2,3]. Several derivatives of this pigment have been now developed with intriguing properties. For instance, the dye, textitthioindigo, reacts with the *palygorskite* clay to exhibit a broad range of colors from red to blue under UV-Vis excitation. The range of colors produced with *sepiolite* clays is smaller. We present spectroscopic analyses of pigments derived from *thioindigo:palygorskite* and *thioindigo:sepiolite* mixtures. ^{27}Al MAS-NMR spectra of *sepiolite* mixtures clearly showed changes in the Al coordination upon reacting with *thioindigo*. However, palygorskite-dye mixtures showed only slight changes in Al coordination. Future work will involve ^{27}Al MAS-NMR analyses of *thioindigo* and clays rich in tetrahedrally coordinated Al to confirm the coordination changes in Al in the presence of *thioindigo*.

B6.00010 Surface and optical analyses of a dye-mineral composite – an XPS, FTIR and Raman study , WILLIAM DURRER, FELICIA MANCIU, Physics Department, ALEJANDRA RAMIREZ, Materials Research and Technology Institute, RUSSELL CHIANELLI, Materials Research and Technology Institute, University of Texas at El Paso — Maya Purple is a pigment produced by mixing the dye thioindigo with the clay mineral palygorskite. In this investigation, we address the questions of how the dye binds to the clay and how such binding might be affected by the organic-inorganic material ratio and of the heating time used in the preparation of the pigment. Synthetically prepared Maya Purple samples were examined using XPS, FTIR, and Raman spectroscopy. XPS measurements show that pigment preparation results in interactions between the dye and the mineral that give rise to several different binding states of the key elemental components oxygen, sulfur, and aluminum. These results are in good agreement with the Raman analysis, where the appearance and disappearance of bands in the 600 cm^{-1}, 1100 cm^{-1}, and 1600 cm^{-1} regions demonstrate interaction affecting oxygen and sulfur. The data are further corroborated by vibrational line shifting in the FTIR data.

B6.00011 Optical phonon modes of PbSe nanoparticles - a Raman and infrared study , FRANCISCO CARRETO, Physics Department, FELICIA MANCIU, Physics Department, University of Texas at El Paso, El Paso TX 79968, YUDHISTHIRA SAHOO, Institute for Lasers, Photonics and Biophotonics, PARAS PRASAD, Institute for Lasers, Photonics and Biophotonics and Department of Chemistry, The State University of New York at Buffalo, Buffalo, NY 14260 — We here demonstrate the use of micro-probe Raman and far-infrared absorption spectroscopy in probing the existence of optical phonon modes of PbSe nanoparticles. The samples were prepared by colloidal chemistry and preliminary characterized by Transmission Electron Microscopy. The Raman results show evidence of the surface phonon (SP) mode. The frequency of this vibration is consistent with its prediction by a dielectric continuum model. While for different PbSe nanoparticle sizes the observed SP mode does not show any obvious change in its position, 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 nanoparticles. Far-infrared measurements demonstrate the presence of the transverse optical and of the coupled phonon modes.

B6.00012 Anomalous Angular Nonstoichiometric Sputtering Yield of a Ga-In Eutectic Target[1]
, MARIEL KERBACHER, Southwestern University, J.W. DEATON, University of Louisiana at Lafayette, L.R. BURNS, N.T. DEOLI, D.L. WEATHERS, UNT, IBMAL TEAM — Sputtering is a thin film deposition technique in which an ion beam fired at a target ejects atoms from the top several layers of the target's surface allowing these atoms to deposit as a thin film on any nearby surface. We employed this technique to deposit the first layers of the Ga-In target onto an aluminum foil which we then analyzed using RBS to determine the angular distribution of sputtered material. The purpose of this experiment is to expand the base of scientific knowledge on sputtering and better understand the sputtering process in hopes of improving models of this process. The Ga-In eutectic alloy used in this experiment has a Gibbsian segregation, in which the first atomic monolayer of the surface is at least 94% Indium, while the second layer is primarily Gallium, as reflected in the alloy's bulk concentration (16.5% Indium). Therefore, the majority of Gallium deposited by sputtering originates from the second atomic monolayer or deeper in the sample. The eutectic alloy is a liquid at room temperature, which is ideal for sputtering processes. Liquid targets are self-healing; their composition does not change over time as atoms are ejected from their surface. Since we know that the majority of Gallium sputtered from the Ga-In target originates from below the first atomic monolayer, studying the angular distribution of Gallium isotopes reveals the behavior of atoms ejected from atomic layers beneath the first monolayer of a target during sputtering.

[1]National Science Foundation

B6.00013 Fabrication of Nanodopatterns Using Microphase Separation of Block Copolymer ,
ANDREW BRADSHAW, Texas A&M University, TAKUO TANAKA, NOBUYUKI TAKEYASU, ATSUSHI TAGUCHI, SATOSHI KAWATA, RIKEN — Arranging and patterning on the nanoscale is of great importance to future efforts in data storage and nano-optical effects such as achieving negative permittivity and permeability at visible wavelengths. One way to achieve these nanoscale patterns is through the use of self-assembling block copolymer solutions. The diblock copolymer used, Polyethylene-block-Poly(ethylene glycol), was dissolved in a suitable solvent and then spin coated onto a substrate. During spin coating the diblock copolymer undergoes microphase separation to produce feature sizes on the scale of tens of nanometers. Further investigation into spin coating efficiency is researched through modification of properties such as solubility of the block copolymer, solvent volatility, and ambient humidity.

B6.00014 Photon trajectories in multiple slit interference experiments with femtosecond pulses of light? , LUIS GRAVE DE PERALTA, Department of Physics, Texas Tech University, AYRTON BERNUSSI, Department of Electrical and Computer Engineering, Texas Tech University — A burst of pulses was observed at each output of the experimental arrangement, when a multiple slit was illuminated with a femtosecond pulse of light. Multiple times of fly became observably different and thus, each pulse in an output burst could be univocally associated with a particular slit. Nevertheless, interference between non-overlapping pulses was also observed. Previously, we have used a Fourier Optics approach to explain why interference was observed in conditions where which-path information was available [1]. We show in this work that the observed interference pattern can also be successfully described assuming that the energy of the light travels following well defined paths. Ref.: [1] "Ultra fast response of arrayed waveguide gratings," L. Grave de Peralta, A.A. Bernussi and H. Temkin, IEEE Journal of Quantum Electronics, vol. 43, 473 (2007).

B6.00015 Creating an Inexpensive Grid for Monte Carlo Calculations , SEAN SMITH, STEVE ALEXANDER, Dept. Physics, Southwestern University, STEPHEN FOSTER, NATHAN LINDZEY, ROBERT S. POTTER, WALTER M. POTTER, JON. T ROGERS, CARL WEST, Department of Math and Computer Science, Southwestern University, R.L. COLDWELL, Dept. Physics, University of Florida, S. DATTA, S.N. Bose National Centre for Basic Science, Calcutta, India — We have developed software that converts an unused PC into a workstation that accepts jobs from a server and sends all results back to this server. Using a grid of up to 100 machines, a set of explicitly correlated wavefunctions optimized by Filippi and Umrigar and variational Monte Carlo we have plotted the electron density, the intracule density, the extracule density, the electron density difference, two forms of the kinetic energy density, the Laplacian of the electron density, the Laplacian of the intracule density and the Laplacian of the extracule density of the ground state of Li2, Be2, B2, C2, N2, O2 and F2 near their equilibrium distance.

B6.00016 A Mathematical Model to Derive the Lorentz Factor, Zero Velocity, and Length Contractions (Finding a Privileged Reference Point) , RICHARD SELVAGGI, CHARLES ROGERS, Texas A&M University, Commerce — This presentation uses Einsteinian concepts to derive the Lorentz factor, intersects observers A and B along a single axis to define a zero point, and uses the zero point to derive the Lorentz factor and understand length contractions. This zero point, as well as any other zero point, can be used by observer A to find A's velocity. The zero point mathematical model demonstrates that A finds that light only travels the hypotenuse distance and that, except at zero velocity, light does not travel the perpendicular distance. Finding a zero point defines a privileged reference point.

B6.00017 Using Genetic Algorithms to Converge on Molecules with Specific Properties , STEPHEN FOSTER, NATHAN LINDZEY, JON ROGERS, CARL WEST, WALT POTTER, Dept. Math and Computer Science, Southwestern University, SEAN SMITH, STEVEN ALEXANDER, Dept. Physics, Southwestern University — Although it can be a straightforward matter to determine the properties of a molecule from its structure, the inverse problem is much more difficult. We have chosen to generate molecules by using a genetic algorithm, a computer simulation that models biological evolution and natural selection. By creating a population of randomly generated molecules, we can apply a process of selection, mutation, and recombination to ensure that the best members of the population (i.e. those molecules that possess many of the qualities we are looking for) survive, while the worst members of the population "die." The best members are then modified by random mutation and by "mating" with other molecules to produce "offspring." After many hundreds (or thousands) of iterations, one hopes that the population will get better and better—that is, that the properties of the individuals in the population will more and more closely match the properties we want.

B6.00018 Using Zero Velocity to Explain the Michelson-Morley and 2007 Rogers-Selvaggi-Chen Experiment , RICHARD SELVAGGI, CHARLES ROGERS, Texas A&M University, Commerce — By accepting Lorentz's length contraction and zero velocity concepts, we can deduce that the speed of light produced in any reference frame is constant and that the produced light's direction is dependent on the velocity of the observer/laser. Since light production is the result of electron physical properties, the function describing the direction of emitted light by electrons to the velocity of the observer/laser is;

$$\sin \theta = \sqrt{(1\text{-}V^2/c^2)} \text{ and } 0 < \theta \leq 90°.$$

B6.00019 Spectroscopic properties of Ho^{3+} in Ho^{3+}:Y$_2$O$_3$ Nanocrystals[1] , DOUGLAS DEE, UTSA-Undergraduate, KELLY NASH, UTSA-Graduate Student, JOHN GRUBER, DHIRAJ SARDAR, UTSA-Professor — Spectroscopic properties are investigated for Ho^{3+} in nanocrystalline Ho^{3+}:Y$_2$O$_3$. Room temperature absorption intensities of Ho$^{3+}(4f^{10})$ transitions in synthesized Ho^{3+}:Y$_2$O$_3$nanocrystals have been analyzed using the Judd-Ofelt (J-O) approach in order to obtain the phenomenological intensity parameters. The J-O intensity parameters are used to calculate the spontaneous emission probabilities, radiative lifetimes, and branching ratios of the Ho^{3+}transitions from the upper multiplet manifolds to the corresponding lower-lying multiplet manifolds $^{2S+1}L_J$ of Ho$^{3+}(4f^{10})$. An 8K absorption spectra was also taken. From that spectra an in-depth crystal field splitting analysis was performed on selected manifolds. A comparison of the manifold splittings for Ho^{3+}:Y$_2$O$_3$ (nano) was made to that observed for Ho^{3+} in large single crystals of Y$_2$O$_3$. Presently we are investigating the fluorescence properties of this nanocrystal. A comparative study of Ho$^{3+}(4f^{10})$ ions suggests that synthesized Ho^{3+}:Y$_2$O$_3$nanocrystals could be an excellent alternative to single-crystal Ho^{3+}:Y$_2$O$_3$for certain applications especially in the visible region.

B6.00020 Absorption Intensities Analysis of Ho^{3+}:KPb$_2$Cl$_5$, SREERENJINI CHANDRASEKHARAN, KELLY L. NASH, JOHN B. GRUBER, DHIRAJ K. SARDAR, University of Texas at San Antonio — Optical absorption and emission intensities were investigated for Ho^{3+} in single crystal Ho^{3+}:KPb$_2$Cl$_5$. Room temperature absorption intensities of Ho$^{3+}(4f^{10})$ transitions in Ho^{3+}:KPb$_2$Cl$_5$ have been analyzed using the Judd-Ofelt (J-O) approach in order to obtain the phenomenological intensity parameters. The J-O intensity parameters are then used to calculate the spontaneous emission probabilities, radiative lifetimes, and branching ratios of the Ho^{3+} transitions from the upper multiplet manifolds to the corresponding lower-lying multiplet manifolds $^{2S+1}L_J$of Ho$^{3+}(4f^{10})$. Presently we are measuring the room temperature fluorescence lifetime of this transition and it will be used to determine the quantum efficiency of Ho^{3+}:KPb$_2$Cl$_5$. From the fluorescence spectrum, the emission cross section of the important manifold $^5I_7 \rightarrow {}^5I_8(2.0\mu m)$ transition will be determined. The 8K absorption spectrum was examined as well. Selected manifolds were analyzed in terms of the crystal field splitting using a charge-compensation model first developed for Er^{3+} doped into KPb$_2$Cl$_5$. The optical and spectroscopic characteristics of Ho^{3+}:KPb$_2$Cl$_5$ show that this material has a potential for 2.0μm laser system.

B6.00021 Frequency Dependence of the Dielectric Response of Select Materials at Microwave Frequencies , R. CAUFIELD, J. ROBERTS, J. DAHIYA, A. ANAND, B. JOHNSON, University of North Texas — Select Materials were probed to determine their susceptibility to microwaves when they were subjected to microwaves over a range of frequencies. In the experiment, the effects sample loading on the magnetic and electrical interactions between a microwave field in a resonant cavity and select samples were monitored using standard perturbation techniques. This interaction is generally described by the equation: $Z = f_1(O_e, E) + f_2(O_m, H)$ (1) Where $f_1(O_e, E)$ is a function of the electric permeability $O_e$and the electric field E, while $f_2(O_m, H)$ is a function of the magnetic permeability $O_m$and the magnetic field H. Changing the volume of the sample that is inserted into a resonant microwave cavity affects the microwave load in the resonant cavity, and thus produces frequency shifts in $f_1$and f_2, and changes in the Q factor of the cavity. Measurements were made for different materials as the microwaves were absorbed by the sample. The $\Delta(1/Q)$ and Δf measurements describe the O_e and O_m interactions within the sample. The results were studied to find the fundamental electric and magnetic properties of the material loaded in the cavity. The results, as well as the behavior of electromagnetic fields allow us to understand the fundamental interaction processes within the sample of material acting as a load in the microwave cavity and to allow us to study frequency dependence on the sample load.

B6.00022 A New Max-Min Variational, Semi-Definite Programming Based, Quantization Procedure. , CARLOS HANDY, Texas Southern University — A new variational quantization procedure is developed exploiting the moment problem based analysis underlying the Eigenvalue Moment Method (EMM) developed by Handy, Bessis, and co-workers [1-5]. The EMM procedure is the first to exploit Semi-definite Programming (SDP) analysis in solving quantum problems, and has played a pivotal role in defining new computational tools for tackling non-Hermitian problems such as those concerning PT-invariant (and symmetry breaking) systems [6] and Regge pole calculations for atomic-molecular scattering [7]. It offers a more rigorous (fool-proof) framework than other methods, including those based on a Hill determinant approach. By extension, these same properties are enjoyed by the new Max-Min variational procedure. We offer some illustrative examples which underscore important convexity properties of the underlying "volcano-function" [4,5]. [1] C. R. Handy and D. Bessis, Phys. Rev. Lett. 55, 931 (1985). [2] C. R. Handy, D. Bessis, T. D. Morley, Phys. Rev. A 37, 4557 (1988). [3] C. R. Handy, D. Bessis, G. Sigismondi, T. D. Morley, Phys. Rev. Lett. 60, 253 (1988). [4] C. R. Handy, K . Appiah, D. Bessis, Phys. Rev. A 50, 988 (1994). [5] C. R. Handy, Phys. Rev. A 52, 3468 (1995). [6] C. R. Handy, J. Phys. A 34, 5065 (2001). [7] C. R. Handy, C. J. Tymczak, A. Z. Msezane, Phys. Rev. A 66, 050701 (R) (2002).

Friday, October 19, 2007 10:40AM - 12:28PM —
Session B7 AAPTK12: AAPT Pre-College Teaching and Teacher Education-Honoring Robert Beck Clark Rudder Tower 707

10:40AM B7.00001 Physics Enhancement Program (PEP) at TAMU: What is Was and What it Accomplished , BILL FRANKLIN, TAMU/PEP — A brief review of the origin and evolution of PEP will be followed by presentation of evidence of its impact on Texas physics teachers and their students.

11:00AM B7.00002 PEPTYC- Multiple Perspectives of the PEPTYC Professional Development Model , TODD LEIF, Cloud County Community College — The physics enhancement project for two year college instructors a.k.a. PEPTYC played a pivotal role in my life as a community college instructor, an invited lecturer, and even now as a graduate student. This talk will focus on the PEPTYC program from three different perspectives: a participant perspective, a past leaders/instructor perspective, and a researcher perspective. Follow along as I take a look at the effects of Robert Beck Clark's visionary program from its inception through its final stages and now its potential to serve as a professional development model of two-year college faculty.

11:20AM B7.00003 Passionately PTRA , EVELYN RESTIVO, PTRA/Maypearl High School — Question: What is the Physics Teaching Resource Agent Program? Answer: Twenty-seven phyabulous years of the most phyantastic physics program in the universe! Highlights from the beginning, Sound offs from the middle, and Moving on with no end in sight.

11:40AM B7.00004 Two-Year Colleges Have a Role in Teacher Preparation , APRIL MOORE, North Harris College — The student population at North Harris College includes elementary education majors, most of whom intend to complete their degrees at Sam Houston State University. Required in the degree plan is a one-semester physics course for non-science majors. Our Elementary Physics 1410 transfers for credit. The instructional approach is student-centered and involves "active learning." The curriculum adopted for the course is Physics and Everyday Thinking (Goldberg, Robinson, & Otero), formerly Physics for Elementary Teachers (PET). In addition to the content focus on fundamental physics principles, this curriculum "has specific goals for helping non-science majors explicitly reflect on the nature of science and the nature of science learning." Resources available to facilitate the implementation of PET include a web-based teacher guide and workshops.

11:52AM B7.00005 Pre-service Teachers Learn the Nature of Science in Simulated Worlds , JILL MARSHALL, University of Texas — Although the Texas Essential Knowledge and Skills include an understanding of the nature of science as an essential goal of every high school science course, few students report opportunities to explore essential characteristics of science in their previous classes. A simulated-world environment (Erickson, 2005) allows students to function as working scientists and discover these essential elements for themselves (i.e. that science is evidence-based and involves testable conjectures, that theories have limitations and are constantly being modified based on new discoveries to more closely reflect the natural world.) I will report on pre-service teachers' exploration of two simulated worlds and resulting changes in their descriptions of the nature of science. Erickson (2005). Simulating the Nature of Science. Presentation at the 2005 Summer AAPT Meeting, Salt Lake City, UT.

12:04PM B7.00006 Correlation of Symbols and Units in AP Physics and AP Chemistry , ANDRZEJ SOKOLOWSKI, Magnolia West High School, NONE TEAM — There are differences in labeling and interprating certain quantities in Physics and Chemistry across high school curriculum. This might cause some misunderstanding in student's minds. This session will underline these quantities and concepts.

12:16PM B7.00007 ATE Program for Physics Faculty[1] , THOMAS O'KUMA, Lee College — This talk will report on this project for two-year college and high school physics teachers. It will include data from the recently held workshops that are part of this project, followup activities conducted by the participants of the project, and some surprising information from the project.

[1]Supported in part by NSF grant #ATE-0603272.

Friday, October 19, 2007 11:00AM - 11:45AM —
Session C1 Invited Session: The Physics of Diving Rudder Tower 601

11:00AM C1.00001 The Physics of Diving , HELMUT KATZGRABER, Department of Physics, ETH — The underwater world, and in particular our oceans, represent a final frontier of exploration. In the past, studying the underwater fauna and flora used to be a dangerous undertaking reserved to professional divers. Technological advances over the last 50 years have given sports divers the opportunity to explore this fascinating world using self-contained underwater breathing apparatuses (SCUBA). Despite these technological advances humans have to cope with an unusual environment: perception is different underwater and there is always a risk of decompression illness due to the ambient pressure. After a brief overview of SCUBA diving, some physical phenomena particular to diving will be presented.

Friday, October 19, 2007 1:30PM - 2:15PM —
Session D1 Post Luncheon Talk: The Teaching Legacy of Robert S. Hyer MSC 224

1:30PM D1.00001 The Teaching Legacy of Robert S. Hyer , ROBERT HYER THOMAS — Robert Hyer would have loved these awards, and especially that they are named to honor him as a Physics Professor, rather than as a University President. While serving as President of Southwestern University (14 years) and President of SMU for 9 years, he continued to teach Physics. As far as we know, his only time off from teaching physics was during the four years he spent building SMU, from the ground up. As soon as SMU opened, he returned to teaching physics. Hyer personally preferred working in his physics lab, learning of the new work of other scientists around the world, and teaching the students entrusted to his care. Teaching physics was his life's work until the day he died.

Friday, October 19, 2007 2:00PM - 3:30PM —
Session E1 Invited Session: Vilches and Engel Rudder Tower 601

2:00PM E1.00001 One-, Two-, and Three-Dimensional Physics with Films Adsorbed on Carbon Nanotube Bundles[1] , OSCAR VILCHES, University of Washington — Carbon nanotube bundles are formed by mostly parallel arrays of single-wall, closed-end carbon nanotubes of about one nanometer diameter and micrometer length, each bundle having from about 30 to over a hundred nanotubes. The nanotubes in the bundles are not of uniform diameter, which leads to bundles not being perfect stacks of nanotubes. On these bundles, one-, two-, and three-dimensional forms of matter can be formed by physisorption. In this presentation I will give a brief introduction to the changes in the solid-liquid-vapor phase diagram of simple substances brought in by dimensionality, followed by introducing carbon nanotube bundles and physisorption. I will use results from current measurements of adsorption isotherms, heat capacity, and neutron diffraction to illustrate to what extent theoretical expectations and experimental results agree (and disagree). I will conclude this presentation with comments on future experiments using a single carbon nanotube as a physisorption substrate. The work described is being carried out in collaboration with David Cobden, Subramanian Ramachandran, and Zenghui Wang.

[1]Work supported by NSF 060678 and Petroleum Research Fund.

2:45PM E1.00002 China and India: A New Sputnik? , DON ENGEL — Fifty years ago, the launch of Sputnik fueled unprecedented public interest in and support of science. Going from 1958 to 1959, Congress increased NSF funding by a factor of five. Since then, public interest and government support have eroded. In the last the last few years, however, the public has become increasingly aware of global competition for jobs and technological supremacy, particularly from China and India, together 40% of world population. Congress recently responded with the passage of the America COMPETES Act, which was signed into law in August. This talk will review how the federal government works and how it deals with science. After a review of current happenings and upcoming challenges, participants will learn how they can effect change in policies that affect science and scientists.

Friday, October 19, 2007 2:00PM - 3:36PM —
Session E2 HEN2: High Energy/Nuclear Rudder Tower 701

2:00PM E2.00001 The LUX Two-Phase-Xenon Dark Matter Search Experiment , TYANA STIEGLER, CHARLIE CAMP, ZACH MARQUEZ, ANDREW RODINOV, JAMES WHITE, Texas A&M University Physics, LUX DARK MATTER COLLABORATION — The race to be the first experiment to detect collisions between atoms and a new type of weakly interacting massive particle (WIMP) that is conjectured to explain dark matter is heating up. The Large Underground Xenon (LUX) detector is a second-generation WIMP dark matter search experiment that employs a liquid xenon target and provides background discrimination based on the ratio of ionization to scintillation produced in subatomic particle interactions. This experiment is designed to reach the heart of the favored parameter space for supersymmetric WIMPs and has a genuine chance to be the discovery experiment. The concept, design, schedule and reach of the experiment will be discussed.

2:12PM E2.00002 A Wavelength Shifting Readout method for Large Gaseous Particle Detectors. , ANDREW RODIONOV, CHARLIE CAMP, ZACH MARQUEZ, TY STIEGLER, JAMES WHITE, Texas A&M University Physics — A new method to readout the ionization of a gaseous-based particle detector is being investigated as part of the research and development effort to develop very large detectors for future WIMP search experiments. In this approach, a grooved plastic scintillator cylinder is used to wavelength-shift the vacuum ultraviolet light produced from proportional scintillation in gaseous xenon. The design and construction of the test chamber is discussed along with preliminary findings.

2:24PM E2.00003 Development of a new WIMP detector concept based on High Pressure Xenon Gas , ZACHARY MARQUEZ, CHARLIE CAMP, ANDREW RODIONOV, TYANA STIEGLER, JAMES WHITE, Texas A&M University Physics — Although a number of proven approaches exist, there is a continuing effort to develop WIMP detectors with improved sensitivity and more economical operation. One approach that shows great promise is based on the ratio of Scintillation to Ionization in pressurized, room temperature Gaseous Nobles (SIGN). Recent research and development results to determine basic properties of pressurized xenon for particle detection as well as background discrimination for WIMP detection will be presented.

2:36PM E2.00004 Investigation of New Methods for Ultra-Low-Background Counting , CHARLIE CAMP, JAMES WHITE, STIEGLER TY, ZACH MARQUEZ, ANDREW RODIONOV — Components of future detectors for dark matter and neutrino physics will require increasingly sensitive radioisotope screening to allow the detectors to reach their needed sensitivities. A selection of potential new approaches will be discussed along with preliminary test data.

2:48PM E2.00005 A dual-axis duo-lateral position sensitive silicon detector upgrade to the FAUST detector Array. , SARAH SOISSON, BRIAN STEIN, Texas A&M University, ROBIN DIENHOFFER, Oswego State University of New York, MARIAN JANDEL, Los Alamos National Laboratory, GEORGE SOULIOTIS, D. SHETTY, Texas A&M University, AUGUST KEKSIS, Los Alamos National Laboratory, SARA WUENSCHEL, ZACHARY KOHLEY, SHERRY YENNELLO, Texas A&M University — In looking at current Silicon detector technology and the design constraints of the Forward Array Using Silicon Technology (FAUST), a dual-axis dual-lateral position sensitive silicon detector has been designed and manufactured to allow for linear position sensitivity in two dimensions without sacrificing isotopic resolution in heavy ion reactions. The design has two conductive strip contacts along opposite edges on each side of the detector. The contacts on the front are perpendicular to those on the back. Each side has a different resistivity. When an incident particle hits the detector, the charge is split between the contacts on each resistive layer. This allows for the total energy to be determined by the summation of either the contacts on the front or the back of the detector. The position of each axis can easily determined using standard formulas such as X $\propto$ (Q1-Q2)/(Q1+Q2), where Q is the charged collected from one contact. Results from preliminary testing show a good energy resolution as well as indicate a linear position response.

3:00PM E2.00006 Calibrating Scintillator position measurement for testing RPC modules for PHENIX at RHIC , DANIEL JUMPER, Abilene Christian University — PHENIX is a large, high-energy experiment at the Relativistic Heavy Ion Collider. One of PHENIX's many goals is to study the spin structure of the proton through observing W-boson decays from quark-anti quark interactions in polarized p-p collisions. An upgraded trigger system using Resistive Plate Chambers that are being built for PHENIX will increase the rejection factor of unfavorable events by two orders of magnitude so that this measurement is possible. As these RPCs are manufactured and assembled into larger sections for installation, an important step in quality assurance is testing each module in a cosmic ray test stand triggered by hodoscopes. These scintillators will also provide a position measurement, giving us positioning information in directions where the stacked RPCs have low spatial resolution. With careful timing calibration the information from the scintillators will enable us to test aspects of the RPC manufacturing that will lead to much higher quality monitoring. This talk will include methods and some results from this positioning measurement.

3:12PM E2.00007 New Superconducting Technology to Enable the Next Generation of High Energy Research , PETER MCINTYRE, Texas A&M University — Two innovations in superconducting technology have the potential to shape the future capabilities for discovery in high energy physics. First, a hybrid dipole has been devised that would utilize windings of the high-temperature superconductor Bi-2212 and the low-temperature superconductor Nb$_3$Sn to produce a field strength of 25 Tesla. The dipole would be suitable to replace the magnet ring in CERN's LHC, and would triple its collision energy in proton-proton colliding beams. Second, a polyhedral cavity has been devised for the high-gradient accelerating structure of an electron-positron linac collider. The polyhedral geometry provides access to the crucial inner surface during all stages of fabrication, and opens the possibility to prepare a heterostructure there that could support rf fields beyond the BCS limit. It also naturally suppresses deflecting modes so that the overall energy efficiency could be significantly improved. These features lead to a possibility for making high-luminosity e+e- collisions at TeV energy.

3:24PM E2.00008 Polyhedral Superconducting Cavities for Linac Colliders , NATHANIEL POGUE, PETER MCINTYRE, DIOR SATTAROV, Texas A&M University — The next priority for research facilities in high-energy physics is an electron-positron linac collider. The technological heart of the project is a ~20 km string of superconducting cavities that must accelerate the two beams to a collision energy of about 1 TeV. The success of the project will depend upon efforts to push the performance and reduce the cost for manufacturing the cavities. A novel approach to cavity design is being developed at Texas A&M, in which the cavities are constructed as a polyhedron. The critical inner surface is accessible through the whole fabrication process. This approach has several interesting benefits: it makes it possible to kill deflecting modes that could limit luminosity, it makes possible a simpler means to refrigerate the cavities, and eliminates the 'breathing' of cavities from the Lorentz pressure when they are energized. The open geometry allows for the use of advanced superconducting materials to push performance. The cavity design will be presented, and work to develop and test models will be described.

Friday, October 19, 2007 3:30PM - 5:06PM —
Session F1 CM2: Condensed Matter Rudder Tower 401

3:30PM F1.00001 Ferromagnetic and non-ferromagnetic dust interactions in complex plasmas

, MATTHEW BENESH, CASPER, Baylor University, JORGE CARMONA-REYES, CASPER, Baylor Unviersity — A GEC rf reference cell is used to create groupings of 4.5 micron melamine formaldehyde dust particles and also of 4.5 micron ferromagnetic dust particles. It is shown that ferromagnetic dust particles respond to variations in chamber pressure in a similar fashion to non-ferromagnetic dust. It is also found that non-ferromagnetic dust particles exhibit more short-range ordering and structure than ferromagnetic dust particles for the range of pressures and powers tested.

3:42PM F1.00002 Crystal Fields and Metamagnetism in NdNiPb and Nd_5NiPb_3[1] , V. GORUGANTI,

K.D.D. RATHNYAYAKA, JOSEPH H. ROSS, JR., Texas A&M University, Y. ONER, Istanbul Technical University — We report magnetic, transport and thermodynamic measurements for recently-synthesized NdNiPb (orthorhombic TiNiSi-type structure) and Nd_5NiPb_3 (hexagonal Hf_5CuSn_3-type structure), as well as non-magnetic Y-based analogs. High-temperature Curie-Weiss fits yield effective moments of 3.59 μ_B for NdNiPb and 3.70 μ_B for Nd_5NiPb_3. These are close to the Nd^{3+} ionic moment, 3.62 μ_B, showing that Ni is nonmagnetic in both cases. For NdNiPb a peak seen in both the magnetization and specific heat at 3.5 K indicates an apparent antiferromagnetic transition at that temperature. Specific heat measurements show this transition to be formed from crystal-field-split Nd magnetic levels, and we have made preliminary estimates of the crystal field scheme. Nd_5NiPb_3 exhibits two magnetic transitions, an antiferromagnetic transition at 42 K and an apparently weak ferromagnetic canting transition at 8 K. Entropy measurements also show the ground state to be composed of crystal-field-split doublet of magnetic levels. M-H curves show metamagnetism at temperatures between the two magnetic transitions. The materials are metallic, and we will discuss transport results providing a further probe of the magnetic behavior.

3:54PM F1.00003 Magnetocrystalline and Shape Anisotropy in Mn_{12}-acetate Micro-Crystals[1] ,

DONGMIN SEO, WINFRIED TEIZER, Department of Physics, Texas A&M University, College Station, TX 77843-4242, USA, HANHUA ZHAO, KIM DUNBAR, Department of Chemistry, Texas A&M University, College Station, TX 77842-3012, USA — We have aligned micro-crystals of Mn_{12}-acetate in a solvent bath by applying an external magnetic field H = 0.5 T at room temperatures. Various states ranging from randomly-oriented to well-oriented state of the same suspension sample have been prepared by applying an external magnetic field 0 T $\leq$ H $\leq$ 1 T at room temperature. DC magnetization has subsequently been measured for these states and alignment behavior was studied as a function of the field. For T < 50 K, the well-aligned state shows a higher magnetization than the randomly-oriented state of the sample. However, for T > 100 K, where the alignment occurs, no significant difference in magnetization was observed between the different states. The observed magnetization difference below 50 K comes from the magnetocrystalline anisotropy. And, shape anisotropy of the micro-crystals may be the main origin of the observed alignment.

4:06PM F1.00004 Studies of oxidation and thermal reduction of the Cu(100) surface using a slow positron beam

, W.B. MADDOX, N.G. FAZLEEV, M.P. NADESALINGAM, A.H. WEISS, Physics Department, University of Texas at Arlington — Positron probes of surfaces of oxides that play a fundamental role in modern science and technology are capable to non-destructively provide information that is both unique to the probe and complimentary to that extracted using other more standard techniques. We discuss recent progress in studies of oxidation and thermal reduction of the Cu(100) surface using positron-annihilation-induced Auger-electron spectroscopy (PAES). PAES measurements show a large increase in the intensity of the Cu M2,3VV Auger peak as the sample is subjected to a series of isochronal anneals in vacuum up to annealing temperature 300˚ C. The intensity then decreases monotonically as the annealing temperature is increased to 600˚ C. Experimental PAES results are analyzed by performing calculations of positron surface states and annihilation probabilities of surface-trapped positrons with relevant core electrons taking into account the charge redistribution at the surface and surface reconstruction. The effects of oxygen adsorption and defects on localization of the positron surface state wave function and positron annihilation characteristics are also analyzed. Possible explanations are provided for the observed behavior of the intensity of the positron annihilation induced Cu M2,3VV Auger peak with changes of the annealing temperature.

4:18PM F1.00005 Ferromagnetism in Mn-implanted Ge and epitaxial GeC[1] , SAMARESH GUCHHAIT,

JOHN MARKERT, Department of Physics, The University of Texas at Austin, MUSTAFA JAMIL, SANJAY BANERJEE, Department of ECE, The University of Texas at Austin — 20 keV energy Mn ions were implanted in two samples: 1) bulk Ge (100) and 2) a 250 nm thick epitaxial GeC film, grown on a Si (100) wafer. The GeC thin film was grown by UHV chemical vapor deposition using a mixture of germane (GeH_4) and methylgermane (CH_3GeH_3) gases and contains less than 1% carbon. X-ray diffraction data shows a single crystal phase for the GeC film, and the surface rms roughness is about 0.3 nm, measured with AFM. The Mn implant dose was 1.1×10^{16}/cm^2 at a temperature of 300° C for both samples. For this relatively low energy Mn ion implant, the range is about 17 nm and the straggle is about 9 nm. A SQUID magnetometer study shows ferromagnetism in both samples. While the Curie temperature for both samples is about 180 K, the in-plane saturated magnetic moment per unit area for the first sample is about 2.2×10^{-5}emu/cm^2 and that for the second sample is about 3.0×10^{-5}emu/cm^2. These results show clear enhancement of magnetic properties of the Mn-implanted GeC thin film over the identically implanted Ge layer due to the presence of a small amount of carbon.

4:30PM F1.00006 Geometric and Electronic Structure of Dodecanethiol SAMs Grown on Au, Ag, Cu, and Pt Crystals

, CARL VENTRICE, HEIKE GEISLER, Texas State Univ., JAMES BURST, SHAWN HUSTON, TIM SWEENEY, DANIEL BORST, Univ. of New Orleans — The geometric and electronic structure of dodecanethiol ($C_{12}H_{25}SH$) SAMs on Au(111), Ag(111), Cu(111), and Pt(111)) substrates has been studied using low energy electron diffraction and angle-resolved ultra-violet photoelectron spectroscopy. The SAMs were grown both in solution and by vapor deposition in UHV. The electronic structure of the fully saturated SAM is similar on all of these substrates, with peaks observed at binding energies of 6.5, 10, 14, and 20 eV. The geometric structure of the molecular films at intermediate coverages is different for each substrate. Growth on Au proceeds through a well-ordered lying-down phase followed by a disordered phase and a well-ordered $\sqrt{3}$ standing-up phase at saturation. Initial growth on Pt(111) shows first a p(2×2)symmetry followed by a $\sqrt{3}$ symmetry, which indicates that there is dissociative adsorption on Pt. This is followed by a disordered phase at saturation. Films on Ag and Cu show a great deal of disorder at all stages of growth.

4:42PM F1.00007 X-Ray Absorption Spectroscopy Study of Iron Silicon Germanide and Osmium Silicide Epitaxial Films[1] , NADER ELMARHOUMI, RYAN COTTIER, FATIMA AMIR, Univ. of North Texas, GREGORY MERCHAN, AMITAVA ROY, CAMD/LSU, HEIKE GEISLER, TERRY GOLDING, CARL VENTRICE, Texas State Univ. — Some of the iron- and osmium-based metal silicide and germinide phases have been predicted to be direct band gap semiconductors. Therefore, they show promise for use as optoelectronic materials. We have used synchrotron-based x-ray absorption spectroscopy to study the structure of iron silicon germanide and osmium silicide films grown by molecular beam epitaxy. Osmium silicide films which are primarily in the Os_2Si_3 phase and a series of $Fe(Si_{1-x}Ge_x)_2$ films with a nominal Ge concentration of up to $x = 0.04$ have been grown. X-ray absorption near edge structure (XANES) measurements on both the iron silicon germinide and osmium silicide films has been performed. An absorption edge shift of 0.9 eV is observed for the osmium silicide films; however, no shift was observed for the iron silicon germinide films. Extended x-ray absorption fine structure (EXAFS) measurements have also been performed on the iron silicon germinide films. The nearest neighbor coordination corresponding to the β-FeSi phase of iron silicide provides the best fit with the EXAFS data.

4:54PM F1.00008 Interaction between silicon and thin films of hafnium oxide[1] , JOHN HICKMAN, STEVEN MCDONOUGH, A.R. CHOURASIA, Dept. of Physics, Texas A&M University-Commerce — Thin films (20 Å) of hafnium were deposited on silicon substrates at base pressure of high 10^{-9} Torr. The substrate temperature was kept at 100, 200, 300, 400, 500, and 600˚C during deposition. The interfaces thus formed were analyzed *in situ* by the technique of x-ray photoelectron spectroscopy using Mg anode as the source of excitation. The hafnium 4f, silicon 2p and oxygen 1s core level regions were investigated. The spectral data were obtained at various take-off angles to investigate the reactivity at various depths. The spectral data show that hafnium gets deposited as HfO_2. As the substrate temperature is increased, changes in the hafnium and oxygen core regions were observed. The data show that HfO_2 gets reduced either to elemental hafnium or to hafnium-suboxide as the substrate temperature is increased. No spectral changes were observed in the silicon core region indicating no chemical reactivity between HfO_2 and silicon till at least 600˚C.

Friday, October 19, 2007 3:30PM - 4:42PM –
Session F2 CM3: Condensed Matter Rudder Tower 510

3:30PM F2.00001 Correlation between Morphology and Defect Luminescence in Precipitated ZnO Nanorod Powders , MICHAEL CLEVELAND[1], Austin College, Sherman, TX, J. ANTONIO PARAMO, RAUL PETERS, YURI M. STRZHE-MECHNY, Texas Christian University, Fort Worth, TX, ZORICA CRNJAK OREL, National Institute of Chemistry, Ljubljana, Slovenia, TEXAS CHRISTIAN UNIVERSITY TEAM[2], NATIONAL INSTITUTE OF CHEMISTRY, LJUBLJANA, SLOVENIA COLLABORATION — We studied ZnO nanosize rod-shaped structures grown by precipitation. Different growth times were employed. We established a direct correlation between the morphology of the particles and their defect emission. Short growth times (30 min.) yielded irregularly shaped particles with insignificant morphological anisotropy. Such samples revealed relatively weak band gap emission, indicating lower quality of the crystal, and a significant deep defect luminescence centered around 2.2 eV and a relatively shallow defect emission peaking at 3.1 eV. Longer growth times (4 hrs. and 24 hrs.) lead to formation of long nanorods with well-defined hexagonal symmetry. These crystals exhibited reduced defect emission indicating significant improvements in crystal quality.

3:42PM F2.00002 Crystallite structure of diamond-silicon carbide composites as a function of sintering temperature , STEPHEN NAUYOKS, TCU, L. BALOGH, ELTE, T.W. ZERDA, TCU — Because diamonds possess many key physical properties, e.g. high hardness and wear resistivity, they are often used in industrial applications. Diamond powder could be sintered with a binding phase to form large volume diamond composites. These diamond composites have a very high hardness and wear resistance, but have relatively low fracture toughness. It has been shown that the use of nano-diamonds in composites has greatly increased the fracture toughness with a minimal decrease in hardness. Silicon-carbide has a high fracture toughness and is often used as a binding phase in diamond composites. Nano-size diamond-SiC composites were sintered under high pressure, high temperature conditions. The crystallite size, stacking fault probability, and dislocation density were determined from x-ray diffraction profiles. It was found that crystallite size increases; while dislocation density and stacking fault probability decreased as sintering temperature increased. These results were confirmed with high resolution TEM images.

3:54PM F2.00003 Synthesis of LaF_3:Ce^{3+} Nanoparticles With Tunable Emissions[1] , MINGZHEN YAO, WEI CHEN, University of Texas at Arlington — Lanthanide based nanoparticles have a good potential as a new kind of luminescent materials. In this presentation, we report the synthesis of Cerium-doped LaF_3 nanoparticles in dimethyl sulfoxide (DMSO) using chemical reaction at different temperature. The samples prepared at low temperature have a similar emission as the samples prepared in water. However, at high temperatures around 180^oC, the emission wavelength shifts with the reaction time, from 490 nm to 650nm. The formation of LaF_3:Ce^{3+} nanoparticles have been identified by X-ray diffraction (XRD) and transmission electron microscopy(TEM). The TEM results show that the average sizes of these nanoparticles are from 10 nm to 13 nm. The mechanisms for the tunable emissions are being investigated.

4:06PM F2.00004 RF Plasma Torch System for Metal Matrix Composite Production in Nuclear Fuel Cladding[1] , EDDIE HOLIK III, Texas A&M University — For the first time in 30 years, plans are afoot to build new fission power plants in the US. It is timely to develop technology that could improve the safety and efficiency of new reactors. A program of development for advanced fuel cycles and Generation IV reactors is underway. The path to greater efficiency is to increase the core operating temperature. That places particular challenges to the cladding tubes that contain the fission fuel. A promising material for this purpose is a metal matrix composite (MMC) in which ceramic fibers are bonded within a high-strength steel matrix, much like fiberglass. Current MMC technology lacks the ability to effectively bond traditional high-temperature alloys to ceramic strands. The purpose of this project is to design an rf plasma torch system to use titanium as a buffer between the ceramic fibers and the refractory outer material. The design and methods of using an rf plasma torch to produce a non-equilibrium phase reaction to bond together the MMC will be discussed. The effects of having a long lived fuel cladding in the design of future reactors will also be discussed.

4:18PM F2.00005 Extraction of quantum dot size from real time RHEED intensity profiles.[1]
, C. RAJAPAKSHA, A. FREUNDLICH, Center for Advanced Materials and Physics department, University of Houston — Semiconductor quantum dots (QDs) have attracted much attention over the past decade due to their potential applications in nano-scale devices. Thus for the performance of many of those devices determination of structural properties of QDs during growth is highly desirable. Reflection high energy electron diffraction (RHEED) is a powerful technique that can be applied to provide in situ real-time structure evolution during thin film growth in high vacuum epitaxial deposition techniques like molecular beam epitaxy. Although it has been shown that the average facet orientation and QD coverage density could be extracted real time from the evolution of RHEED patterns, to date no study was able to provide a method to extract size of QDs during growth. Recently our group, using an analysis based on the kinematical diffraction theory, has predicted that QD heights can be directly extracted from predicted intensity fringes along the chevron tails. In this study RHEED patterns of uncapped faceted self assembled InAs Stranski-Krastanov quantum dots fabricated on GaAs (001) substrate are investigated both theoretically and experimentally. We report the experimental evidence on the existence of these periodic RHEED intensity fringes along chevron tails and demonstrate the possibility of real time assessment of dot size during the growth of self assembled QDs.

4:30PM F2.00006 Synchrotron based measurements of the photoelectron spectrum of CdTe nanoparticles[1] , AALE NAQVI, University of Texas at Arlington, S. HULBERT, Brookhaven National Laboratory, R. SUNDARAMOORTHY, University of Texas at Arlington, W. CHEN, A.H. WEISS, The University of Texas at Arlington — Nanoparticle solutions of CdTe of size 540, 585, 656nm, and Au were deposited on silicon substrates of approximately 1cm x 1 cm after etching the substrate with HF. The samples were exposed to soft x-rays of varying energy under ultra high vacuum, $\sim 10^{-10}$ torr using beam line U16B at the National Synchrotron Light Source (NSLS) at Brookhaven National Lab. The mechanism of the NSLS storage rings—VUV and X-ray—and the design of the beam are described. We performed Auger electron spectroscopy measurements on the samples and identified the peaks through spectroscopic analysis and monitored the damage of the nanoparticles by observing their fluorescence by gradually increasing the photon energy. The nanoparticles were observed to exhibit a time dependent damage response. Future studies aimed at exploring the potential use of nanoparticles as radiation sensitizing agents for cancer treatment are proposed.

Friday, October 19, 2007 3:30PM - 5:18PM —
Session F3 AMO2: Atomic, Molecular and Optical Physics Rudder Tower 501

3:30PM F3.00001 Tunable femtosecond dispersive waves generation in PCF[1] , JIAHUI PENG, ALEXEI V. SOKOLOV, Institute for Quantum Studies and Physics Department, Texas A&M University, College Station, TX 77843-4242 — Tunable femtosecond optical pulses are widely needed in various applications. Recently, the largest tuning range is generally achieved by adding the desired filter after white light generation, which causes a complicated system and a low efficiency. Due to the most recent development of photonic crystal fibers (PCF), the optical dispersion behavior can be modulated a lot. With ultrashort pulses propagating along the fiber, this modulated dispersion can resolve generation of new wavelengths. We will show that more efficient tunibility can be achieved by simply using a femtosecond oscillator and a piece of PCF, and the tuning range will cover more than octave spectrum. The autocorrelation shows that with a femtosecond pulse propagating in a reasonable short PCF, the shifted pulses are femtosecond pulses as well. This phenomenon may expand applications in the fields that the laser wavelengths are not easily obtained.

3:42PM F3.00002 Dynamical evolution of correlated spontaneous emission of a single photon from a N atoms cloud[1] , JUN-TAO CHANG, ANATOLY SVDZINSKY, MARLAN SCULLY, Institute for Quantum Studies and Department of Physics, Texas A&M University, College Station, TX 77843 — We study the correlated spontaneous emission from a dense spherical cloud of N atoms uniformly excited by absorption of a single photon. We find that the decay of such a state depends on the relation between an effective Rabi frequency $\Omega \propto \sqrt{N}$ and the time of photon flight through the cloud R/c. If $\Omega R/c < 1$ the state exponentially decays with rate $\Omega^2 R/c$ and the state life time is greater then R/c. In the opposite limit $\Omega R/c \gg 1$, the coupled atom-radiation system oscillates between the collective Dicke state (with no-photons) and the atomic ground state (with one photon) with frequency Ω while decaying at a rate c/R.

3:54PM F3.00003 Femtosecond pulses propagation through pure water , LUCAS NAVEIRA, ALEXEI SOKOLOV, JOONG-HYEOK BYEON, GEORGE KATTAWAR, Texas A&M University, AMO PHYSICS TEAM — Recently, considerable attention has been dedicated to the field of optical precursors, which can possibly be applied to long-distance underwater communications. Input beam intensities have been carefully adjusted to keep experiments in the linear regime, and some experiments have shown violation of the Beer-Lambert law. We are presently carrying out experiments using femtosecond laser pulses propagating through pure water strictly in the linear regime to study this interesting and important behavior. We are also employing several new and innovative schemes to more clearly define the phenomena.

4:06PM F3.00004 The Ultrashort laser pulses in water that violates the Lambert-Beer Law
, JOONG BYEON, GEORGE KATTAWAR, LUCAS NAVEIRA, ALEXEI SOKOLOV, Texas A&M University Physics — Recent experiments have opened the possibility that by using ultrashort Laser Pulse in H2O, it may be possible to propagate light (signal) over much further distance than predicted by the familiar Beer-Lambert Law. To explain it, the complete femtosecond-width pulse propagation process will be modeled and simulated by FDTD method in visible frequency range. We will show how the FDTD method can be used to accuately model the propagation of Ultrashort pulses in water. We will also show the development of the both the Sommerfeld and Brillouin optical precursors. We will, for the first time, use the actual absorption spectrum of water in these calculations and compare the results with experimental data.

4:18PM F3.00005 Quantum control of electromagnetically induced transparency by optical phase , H. LI, Texas A&M University, J.P. DAVIS, Naval Air Systems Command, V.A. SAUTENKOV, Y.V. ROSTOVTSEV, G.R. WELCH, Texas A&M University, F.A. NARDUCCI, Naval Air Systems Command, M.O. SCULLY, Texas A&M University — Coherence in a three-level atomic medium can be created by two resonant optical fields. In this case the optical and atomic phases are locked and absorption of the medium decreases. This effect is well known as electromagnetically induced transparency (EIT). Recently F. A. Narducci with co-workers has suggested a quantum control of the transparency by changing phase of the optical field. In this paper we report results of experimental study of EIT dynamic in Rubidium atomic vapor. The optical phase of one of the optical fields is changed as a step function by electro-optical phase modulator. We have observed very fast variation of the transmission with a rise time of the order of inverse Rabi frequency at nanosecond scale. Variation of the transmission is proportional to the phase change and it can be comparable with amplitude of the EIT resonance. The transmission restores to the original EIT level slowly with the ground state relaxation rate(microsecond scale). We have confirmed that it is possible to control EIT by the optical phase. These results open a way to build up fast optical modulates and switches based on EIT.

4:30PM F3.00006 Two-photon excitation by chirped and optimally shaped pulses[1] , MILAN POUDEL, ALEXANDRE KOLOMENSKII, HANS SCHUESSLER, Department of Physics, Texas A&M University College Station TX-77843-4242 — Two-photon fluorescence of different dyes was optimized by using a feedback control femtosecond pulse shaping technique. For optimization we implemented a liquid crystal pulse shaper in a folded 4f set-up with an evolutionary algorithm. The optimization procedure that started with a near transform-limited pulse noticeably improved the two-photon fluorescence. Several signal ratios involving two-photon fluorescence, second harmonic generation and the incident laser power were successfully optimized. The two-photon fluorescence was also optimized by varying the chirp of the laser pulse with a liquid crystal and acousto- optical modulators. The correlation between the two-photon fluorescence and the second harmonic generation was studied, and it was found to decrease when the pulse shape was close to the optimum.

[1]This work was supported by the Robert A. Welch Foundation grant # A1546.

4:42PM F3.00007 Towards Superfluorescence in Cesium Vapor[1] , GOMBOJAV O. ARIUNBOLD[2], DMITRY PESTOV, HEBIN LI, VLADIMIR A. SAUTENKOV, XI WANG, MIAOCHAN ZHI, ALEXEI V. SOKOLOV, YURI V. ROSTOVTSEV, MARLAN O. SCULLY, TAMU TEAM — Cesium atoms have been excited by two photon process into coherent superpostion of the excited $8S_{1/2}$ and ground $6S_{1/2}$ states via ultrashort laser pulse ($\sim$50fs). A superfluorescent blue light (456nm) at the lower transtion of $7P_{3/2}$– $6S_{1/2}$ has been studied. By the use of high resolution (2.5ps) streak camera (Hamamatsu) the delay of the blue pulse has been measured as a function of the input IR beam power. In cases of the different vapor temperature, it has been shown that, this dependence can be scaled by the ratio of the number of interacting Cs atoms. The delayed ultrashort pulses provide temporal characteristics of the superfluorescence. In doing so, we have observed the autocorrelation of the superlfuorescent light which shows interference much later, eventhough, there no interference exhibits between two input pulses.

[1]This work has been supported by the Office of Naval Research under award N00014-03-1-0385, Defense Adv. Res. Proj. Agency, the National Science Foundation (grant PHY-0354897), award from Research Corporation and the Robert A. Welch Foundation.
[2]permanent address: National University of Mongolia

4:54PM F3.00008 Visualizing Molecular Wavefunctions Using Monte Carlo Methods , STEVE ALEXANDER, Southwestern University, R.L. COLDWELL, University of Florida — Using explicitly correlated wavefunctions and variational Monte Carlo we calculate the electron density, the electron density difference, the intracule density, the extracule density, two forms of the kinetic energy density, the Laplacian of the electron density, the Laplacian of the intracule density and the Laplacian of the extracule density on a dense grid of points for the ground state of the hydrogen molecule at three internuclear distances (0.6,1.4,8.0). With these values we construct a series of contour plots and describe how each function can be used to visualize the distribution of electrons in this molecule. We also examine the effect of electron correlation on each expectation value by calculating each function with a Hartree-Fock wavefunction and then comparing these values with our explicitly correlated values.

5:06PM F3.00009 Loading Dynamics and Characteristics of a Far Off-Resonance Optical Dipole Trap[1] , P.G. MICKELSON, Y.N. MARTINEZ, S.B. NAGEL, A.J. TRAVERSO, T.C. KILLIAN, Rice University — We implement an optical dipole trap in a crossed beam configuration for experiments with ultracold strontium. Strontium atoms cooled to nearly 1 μK are loaded into the optical dipole trap from a magneto-optical trap operating on the 689 nm intercombination line. Loading dynamics and characteristics of the far off-resonance dipole trap are explored as part of our group's study of ultracold collisions in strontium.

[1]The presenting author acknowledges support from the W.M. Keck Foundation.

Friday, October 19, 2007 3:30PM - 4:54PM —
Session F4 GEN2: Biological, Chemical and General Physics Rudder Tower 504

3:30PM F4.00001 The Structure of the Metal Transporter Tp34 and its Affinity for Divalent Metal Ions , GREGORY KNUTSEN, University of Dallas, RANJIT DEKA, CHAD BRAUTIGAM, DIANA TOMCHICK, MISCHA MACHIUS, MICHAEL NORGARD, UT Southwestern Medical Center, STRUCTURAL BIOLOGY LAB OF UT SOUTHWESTERN MEDICAL CENTER COLLABORATION, NORGARD LAB AT UT SOUTHWESTERN MEDICAL CENTER COLLABORATION — Tp34 is periplasmic membrane protein of the nonculitvatable spirochete *Treponema pallidum*, the pathogen of syphillis. It was proposed that Tp34 is a divalent metal transporter, but the identity of the preferred metal ion(s) was unclear. In this study we investigated the ability of divalent metal ions to induce rTp34 dimerization using hydrodynamic techniques and determine the crystal structure of metal bound forms. Using analytical ultracentrifugation sedimentation velocity experiments, we determined that cobalt is superior to nickel at inducing the dimerization of rTp34. rTp34 was crystallized and selected crystals were incubated at a pH 7.5 with $CuSO_4$ and $NiSO_4$. Diffraction experiments were conducted and the processed electron density maps showed that copper was bound to the major metal binding site as well as to three additional minor binding sites. By contrast nickel was only bound to the major metal binding site in one monomer and to three additional minor sites. These results along with previous findings support evidence of Tp34 being involved with metal transport and/or iron utilization.

3:42PM F4.00002 Maximum Entropy Principle for the Microcanonical Ensemble , DONALD KOBE, MICHELE CAMPISI, University of North Texas — We derive the microcanonical ensemble from the Maximum Entropy Principle using the phase space volume entropy of Gibbs. Maximizing (or extremizing) the entropy with respect to a general probability distribution and using the constraints of normalization and average energy, we obtain the condition that the energy is a constant E that characterizes the microcanonical ensemble. We justify the phase space volume entropy of Gibbs by showing that the combined first and second laws of thermodynamics is satified, a condition that Boltzmann called orthodicity. We also show that the entropy calculated from the Tsallis q-escort probability distribution approaches the phase space volume entropy in the limit as q approaches minus infinity. Our approach is in contrast to the commonly accepted derivation of the microcanonical ensemble from the Maximum Entropy Principle that assumes a priori that the energy E is a constant. Then the Shannon information theory entropy with only the constraint of normalization gives Laplace's Principle of Insufficient Reason for the states with the constant energy E.

3:54PM F4.00003 Ultraviolet Absorption Spectra and the Quasi-planarity of Pyridine and its d_5 Isotopomer in its $S_1(\pi,\pi^*)$ Excited State[1] , PRAVEEN BOOPALACHANDRAN, KATHLEEN MCCANN, JAAN LAANE, Texas A&M University, College Station, Texas — The ultraviolet absorption spectra of pyridine-d_0 and $-d_5$ vapor have been recorded and analyzed in the 32,000 to 38,000 cm^{-1} region. The electronic band origins are at 34,767 (d_0) and 34,945 cm^{-1} (d_5) for the two isotopomers. For both molecules series of transitions for ν_{18}, the out-of-plane ring-bending vibration, in the excited electronic state can be observed, and a one-dimensional potential energy function of the form V $= ax^4 - bx^2$ can be determined, where x is the out-of-plane vibrational coordinate. In the S_0 electronic ground state pyridine is rigid and planar with ν_{18} at 403 cm^{-1}. In the $S_1(\pi,\pi^*)$ excited state ν_{18} drops to 59.5 cm^{-1} and the molecule becomes floppy with a tiny barrier to planarity of 3 cm^{-1} resulting in a quasi-planar structure.

4:06PM F4.00004 Laser Induced Fluorescence and Ultraviolet Absorption Spectra, DFT Calculations, and Structure of 1,3-Benzodioxan[1] , KATHLEEN MCCANN, Texas A&M University, College Station, Texas, MARTIN WAGNER, JAEBUM CHOO, JAAN LAANE, Texas A&M University, College Station, Texas — The laser induced fluorescence spectra, both excitation and dispersed, of jet-cooled 1,3-benzodioxan along with ultraviolet absorption spectra of the ambient temperature vapors have been recorded and analyzed. The focus of the study was on the low-frequency out-of-plane vibrational modes which are useful for determining the potential energy surface which governs the molecular structure. In the S_0 electronic ground state these have vibrational frequencies of 107.6 cm^{-1} (ring-bending), 157.3 cm^{-1} (ring-twisting), 275.1 cm^{-1} (ring-flapping), and 350.2 cm^{-1} (ring-twisting at the benzene ring). The corresponding values for the $S_1(\pi,\pi^*)$ excited state are 96.3, 102.2, 194.6, and 255.8 cm^{-1} with the lower values reflecting a less rigid ring structure. DFT calculations predict a twisted structure and a barrier to planarity of 3475 cm^{-1} for the S_0 ground state and this is consistent with the experimental data.

4:18PM F4.00005 Exploration of Functionalized Nanoparticles for Fingerprint Detection , JACOB AJIMO, LUN MA, XING ZHANG, KWAN CHENG, WEI CHEN, DEPARTMENT OF PHYSICS TEXAS TECH TEAM, DEPARTMENT OF PHYSICS UT AT ARLINGTON TEAM — We report an exploratory study on the use of water soluble luminescent nanoparticles for latent fingerprint detection. Thioglycolic acid coated CdTe and ZnS:Mn^{2+} nanoparticles were used for fingerprint detection. Latent fingerprints on glass, aluminum and plastic substrates have been successfully labeled with the nanoparticles for periods ranging from 20 minutes to 24 hrs. The labeling is probably due to the amidation reaction between the functional carboxyl group of the nanoparticles with the amine groups of the biomaterials present in the fingerprint residues. The specificity of the nanoparticles at various wavelengths is displayed in the resulting images. The nanoparticles have high quantum yields, tunable fluorescence wavelength and are photo-stable which make them suitable for use in developing ultra-sensitive, target –specific and background suppressed latent fingerprint detection.

4:30PM F4.00006 East Antarctic Ice Sheets: Potential for Sub-Glacial Water Based on Temperature Modeling[1] , ANNETTE BORCHARD, HEATHER HANEMAN, University of Dallas, PETER BURKETT, SRIDHAR ANANDAKRISHNAN, The Pennsylvania State University, CENTER FOR THE REMOTE SENSING OF ICE SHEETS TEAM, STUDENT RESEARCH OPPORTUNITY PROGRAM AT PENN STATE TEAM — This project addressed the issue of whether a sub-glacial lake exists at a location about 10 km from the Amundsen-Scott Station in Antarctica. Computer modeling was used to predict the temperature at the base of the ice sheet to determine whether or not it was actually frozen and thus determine whether it would be possible to drill into the lake without contaminating any potential sub-glacial water systems. Temperature data from the AMANDA (Anarctic Muon and Neutrino Detector Array) and equations from Paterson, *The Physics of Glaciers*, were used to build the model and approximate values which are not known well experimentally. The results indicated that there is a reasonable chance that liquid water exists at the base and thus that careful consideration should be taken before drilling at this site.

4:42PM F4.00007 Nano-patterned elastic polymer , SOYEUN PARK, Department of Physics, Texas Tech University, DAVE KAHN, Department of Chemical Engineering, WOLFGANG FREY, Department of Biomedical Engineering, The University of Texas at Austin — Polymers grown by surface-initiated polymerization have received increasing attention due to the ability to control chain length and achieve high-density grafting, which are both needed in a variety of chemical to biomedical applications, including the stabilization of colloids and the fabrication of cell adhesion-promoting surfaces for tissue engineering scaffolds. Interestingly, surface-grafted polymers on nanoislands have fundamentally unique properties due to the confinement effects. Growing polymers on homogeneous or micro-patterned surface with well-controlled length has been achieved successfully. However, the polymer growth in nano-scale patterns with well controlled length and lateral size has been challenging. By combining a surface-initiated polymerization, self-assembly, and nano-sphere lithography, we successfully developed a unique technique to grow polymers on a nano-patterned substrate. With this technique, we were able to fabricate polymer brushes with high grafting densities and the well controlled polymer length on laterally confined nano-islands. The polymer nano-islands were characterized, and the elastic properties of the nano-patterned polymer gel were investigated using AFM 2D-force spectroscopy.

3:30PM - 3:30PM –
Session F6 P2: Poster Session II MSC 292

F6.00001 A Student Experiment to Prove the Laws of Conservation of Energy and Momentum for Nuclear Reactions Using a 1.5 MeV Van de Graaff Accelerator[1] , J'NAE ZWASCHKA, Tarleton State University, P. KEAHEY, Southwestern University, L. PHINNEY, J. DUGGAN, University of North Texas — The year 1931 saw the first artificially induced nuclear reaction in the Cavendish Laboratory. The men behind this ground breaking experiment, J.D. Cockcroft and E.T.S. Walton, used a 150 kilovolt accelerator with a screen of zinc sulfide to detect the emitted alpha particles from the ^{7}Li (p,α)α reaction. In 1951 the Nobel Prize was awarded in recognition of work that in effect started the nuclear age. The Q value for a nuclear reaction is defined as Δmc^2, where Δm is the mass converted to energy during the reaction. In order to study the kinematic equations the following reactions were performed: ^{7}Li (p,α)α, ^{6}Li (p,^{3}He)α, ^{19}F (p,α)^{16}O and ^{11}B (p,α)^{8}Be. The experiments were carried out with a 1.5 MeV proton beam from a Van de Graaff accelerator. The experimental energies for the reaction products were compared to the theoretical values obtained using the kinematic equations.

F6.00002 Deuterium Depth Profiling of Semiconductor Devices Using the ^{3}He(d,p)^{4}He Reaction , L.C. PHINNEY, M. DHOUBADEL, J.L. DUGGAN, University of North Texas, O.W. HOLLAND, Amethyst Research, Incorporated, F.D. MCDANIEL, University of North Texas — The non-resonant reaction, ^{3}He(d,p)^{4}He, is commonly used to determine the depth profile of deuterium in various materials such as group II-VI and III-V semiconductors. While deuterium can passivate electrically-active defects in materials, the 'decoration' or tagging of defects by deuterium provides a simple method for defect profiling. This is important in many materials, such as HgCdTe, CdTe, and GaN, whose properties are substantially degraded by a high-density of as-grown defects. Thus, NRA of deuterated material was investigated to determine its efficacy in analysis of defect profiles, i.e. the concentration and location of the defects. We have demonstrated that the ^{3}He-D reaction accurately predicts the total deuterium in samples. Results were obtained using a 640 keV ^{3}He beam and a large solid-angle detector to count the reaction products, i.e. p, and ^{4}He. Results will be presented, which were obtained using detectors of different thicknesses. Both standards and computer simulations were used to normalize our results.

F6.00003 Save the Crew: A Superconducting Toroid Shield for Deep-Space Manned Missions , RYAN ROMERO, AKHDIOR SATTAROV, PETER MCINTYRE, Texas A&M — Without proper shielding, astronauts traveling beyond the Earth's magnetosphere would be exposed to lethal doses of radiation. Passive shielding is not adequate to protect astronauts from either high-energy galactic cosmic rays or the intense bursts of energetic protons from solar flares. A more effective way is to create a magnetosphere on the spacecraft using a superconducting toroid that surrounds the crew compartment. The optimal geometry of the toroid, computed mechanical stresses, and results of radiation dose calculations are presented and compared with the passive shielding scenario.

F6.00004 Positron Emission Tomography: A Basic Analysis[1] , M.E. KERBACHER, Southwestern University, J.W. DEATON, University of Louisiana at Lafayette, L.C. PHINNEY, L.J. MITCHELL, J.L. DUGGAN, UNT, IBMAL TEAM — Positron Emission Tomography is useful in detecting biological abnormalities. The technique involves attaching radiotracers to a material used inside the body, in many cases glucose. Glucose is absorbed most readily in areas of unusual cell growth or uptake of nutrients so through natural processes the treated glucose highlights regions of tumors and other degenerative disorders such as Alzheimer's disease. The higher the concentration of isotopes, the more dynamic the area. Isotopes commonly used as tracers are 11C, 18F, 13N, and 15O due to their easy production and short half-lives. Once the tracers have saturated an area of tissue they are detected using coincidence detectors collinear with individual isotopes. As the isotope decays it emits a positron which, upon annihilating an electron, produces two oppositely directioned gamma rays. The PET machine consists of several pairs of detectors, each 180 degrees from their partner detector. When the oppositely positioned detectors are collinear with the area of the isotope, a computer registers the location of the isotope and can compile an image of the activity of the highlighted area based on the position and strength of the isotopes.

F6.00005 An Investigation of the Canis Major Overdensity , W. LEE POWELL JR., RONALD WILHELM, KEN CARRELL, Texas Tech University — Using 2MASS colors Martin et al. (2004) uncovered evidence for a remnant dwarf galaxy in Canis Major, in the form of an overdensity of M-giant stars. The spatial distribution of the M-giants indicate an extended, and likely disrupted, group of stars extending over roughly 30 degrees of the sky. We present new photometry and color magnitude diagrams for various Canis fields obtained at McDonald Observatory and Cerro Tololo Inter-American Observatory. We also obtained spectra at McDonald Observatory of blue stars selected from the photometry. I present kinematic results.

F6.00006 VLBI Imaging of Active Galactic Nuclei[1] , CASSIDY SMITH, Texas Christian University, CHRISTIAN AARS, Angelo State University, ANGELO STATE UNIVERSITY COLLABORATION, TRINITY UNIVERSITY COLLABORATION — We employ high-resolution, high-sensitivity, very-long baseline interferometry (VLBI) radio imaging of parsec-scale jets in radio sources to confirm a partial unification theory of active galactic nuclei (AGNs). Various types of AGN contain supermassive black-holes viewed with different orientation angles to the observer's line-of-sight. In the radio, most AGN can be divided into a very bright central core component and a fainter, elongated jet component. We have used a program called DIFMAP to construct high- resolution images of the quasar 3C207, and then modeled the structure of the core and inner jet components. Images of 3C207 were obtained over six epochs in 2005, to observe temporal changes in the core/jet structure. We find multiple components within the core, oriented in a manner that is consistent with their jet components. Some evidence of bending is seen as well. Bending can be interpreted both as evidence of jet interactions with the interstellar medium or as possible precession of the black hole's rotation axis.

F6.00007 Determining the Viscous Potential from MHD Simulations and Comparing it to Observations[1] , ROBERT BRUNTZ, RAMON LOPEZ, Univ. of Texas at Arlington, MICHAEL WILTBERGER, UCAR, HAO, JOHN LYON, Dartmouth College — The viscous potential is produced by a mechanical interaction between the magnetosphere and the solar wind and is generally thought to have a value of about 20 kV. Preliminary investigations using the Lyon-Fedder-Mobarry global MHD simulation indicate that the viscous potential increases with increasing solar wind density. To determine if this is in fact the case, we have selected solar wind intervals where the ionospheric potential due to merging with the solar wind should be extremely small. During those periods, we use the DMSP satellites to determine the value of the transpolar potential, which we assume to be driven primarily by the viscous interaction. In this study we will compare those observations to the MHD results.

F6.00008 Measures of Geo-effectiveness in Storms[1] , ELIZABETH MITCHELL, RAMON LOPEZ, Univ. of Texas at Arlington — Geomagnetic storms are produced by solar wind disturbances causing large currents to flow throughout the magnetosphere. These currents are the magnetosphere's response to the solar wind electric field and the rate of the interplanetary magnetic field's reconnection with the magnetosphere. To gauge the geo-effectiveness of a storm, or the magnetosphere's response to the storm, we consider the ratio of the ring current injection rate (RCIR) to measures of the solar wind input. *Burton et al.* [1975] called this parameter α, using VB_s as the solar wind input. We calculate three versions of α: α_1 is the *Burton et al.* [1975] parameter, α_2 is the ratio of the RCIR to the *Newell et al.* [2007] universal coupling function, α_3 is the ratio of the RCIR to a measure of the dayside reconnection rate recently proposed by Borovsky. Using each of these values of α, we rank 100 storms with Dst < -75 nT, between 1995 and 2005. The top 10% and lowest 10% of storms are examined in detail to determine what characteristics they might have in common.

F6.00009 Skill Scores for Ionospheric Modeling[1] , JORGE LANDIVAR, Department of Physics, University of Texas at Arlington, Arlington, TX 76019, United States, ALAN BURNS, HAO, NCAR, Boulder, CO 80301, United States, RAMON LOPEZ, Department of Physics, University of Texas at Arlington, Arlington, TX 76019, United States — This paper examines two ionospheric models, Themosphere Ionosphere Nested Grid (TING) and International Reference Ionosphere (IRI), and compares them to each other and to ionosonde data from the SPIDR data base for the time period of July 1995 from the 4th through the 17th. We make this comparison by calculating standard skills scores. TING had a much larger dynamic range than IRI and overall both weren't good fits to the data being at times as far off as 20% or more.

F6.00010 Correlation between precipitation, dust storms and Gulf of California moisture surges in the Paso del Norte region during the North American Monsoon , JOSE NEGRETE, ASTRID LOZANO, ROSA FITZGERALD, UTEP, KARINA APODACA, VERNON MORRIS, Howard University — Previous statistical analyses performed by the authors have demonstrated an anti-correlation between dust storms and precipitation during the North American Monsoon. During monsoon season both precipitation and dust storms appear to be associated with a moisture inflow approaching from Gulf of California (GOC) labeled as a "moisture surge." A series of meteorological observations are presented in an effort to establish a connection between dust storms and reduced precipitation amounts in El Paso, Texas and surrounding areas in the presence of GOC moisture surges. These data sets were utilized (1) to recognize GOC moisture surges, (2) to investigate whether increased aerosol mass and number densities were responsible for decreased precipitation amounts, and (3) to evaluate atmospheric conditions during a moisture surge in the Paso del Norte region.

F6.00011 A One-Way Light Beam Experiment , CHARLES ROGERS, AAPT, RICHARD SELVAGGI, HAO-LIANG CHEN — A one-way light experiment has been recently designed and implemented to determine the displacement of a light beam after traveling a straight path of sixty meters as a function of time. The primary goal of this experiment is to determine the affect of the earth's motion on the propagation of light from a source to a sensor both of which are stationary in the laboratory frame of reference. Progressive improvements to the inital design over the past three months have resulted in angular measurements with nanoradian resolution. Beam position data and environmental data along the path are being collected over time periods of several days. Additional improvements to the apparatus are being considered. A detailed description of the experiment and its operation is given. Also presented are (1) the data collected during the development phase and (2) the results from a preliminary analysis of these data.

F6.00012 Analitic Thermodynamic Calculations for an Immobilized Molecule under Poisson-Boltzmann Interactions using a Spheroidal Geometry , JOAQUIN AMBIA-GARRIDO, BERNARD MONTGOMERY PETTITT, University of Houston — The change in some thermodynamic quantities such as Gibbs' free energy, entropy and enthalpy of the binding of a particle tethered to a surface or particle are analytically calculated. These particles are considered ellipsoids and submerged in a liquid. The ionic strength of the media allows the linearized version of the Poisson-Boltzmann equation (from the theory of the double layer interaction) to properly describe the interactions between an ion penetrable spheroid and a hard plate. We believe that this is an adequate model for a DNA chip and the predicted electrostatic effects suggest the feasibility of electronic control and detection of DNA hybridization and design of chips, avoiding the DNA folding problem.

F6.00013 AC losses in conventional and block coil geometry superconducting dipoles[1] , ALFRED MCINTURFF, PETER MCINTYRE, AKHDIYOR SATTAROV, Department of Physics, Texas A&M University — The upgrade of injection synchrotrons of LHC requires pulsed magnets reaching 5T with a ramp rate of the order of 1-2T/s. AC losses in the magnets are the major concern. A standard method of AC loss evaluations underestimates experimental results in the critical high field region A modified method used to estimate AC losses in GSI001 model magnet tested recently at BNL gave an excellent agreement with the experimental results. Both methods were applied to analyze recent designs of a cosine current distribution and block-coil geometry superconducting dipoles. We find that the simple and robust block-coil geometry dipole over performs conventional one in both: reduced AC losses and less amount of superconducting wire.

F6.00014 The Use of Color as a Third Dimension on Maps[1] , XIMENA CID, RAMON LOPEZ, Univ. of Texas at Arlington, STEVEN LAZARUS, Florida Institute of Technology — This study investigated student understanding of the use of to represent height and temperature. Fifty-four undergraduates were surveyed. Eight students were chosen interviewed to investigate in more detail the responses provided on the surveys. We found that students have an embedded color scheme for temperatures, with red representing hot and blue representing cold (as expected), but there was no embedded scheme when color was applied to height. We found that students did not have a preference when viewing a topographic map with different color schemes, but did prefer the color scheme of the figure that they viewed first. We observed that the students did have a prior notion of what the topographic figure was representing, and tried to fit the color scheme shown to match their idea. During the interviews we also found that even the slightest deviations from a specific color scheme gives rise to confusion. These results, therefore, show the importance of detail consistency when using visualizations in a lecture where the population is composed of novices.

F6.00015 Designing Water Rockets as a Multi-disciplinary Project for Physics, Calculus, and Engineering Courses , PAUL FISHER, DAVID CRAIG, EMILY HUNT, PAMELA LOCKWOOD, West Texas A&M University — We report the development of a cross-disciplinary activity for strengthening and relating student understanding of concepts from introductory physics, calculus, and engineering courses. Students, most simultaneously enrolled in all three classes, used material from physics and calculus to design rockets built from soda water bottles. They then constructed these rockets and a launcher in their engineering class and concluded the project with a public launch. Topics addressed include kinematics, dynamics, and fluid dynamics.

Friday, October 19, 2007 3:30PM - 5:30PM –
Session F7 W1: AAPT Scheduled Workshops Heldenfels Hall 219

3:30PM F7.00001 How to Survive Your First Five Years of Teaching Physics , CAROLYN SCHROEDER, Texas A&M University, DEBBIE WALKER, Montgomery High School, HOLLY DUNCAN, Region 9 Education Service Center — 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 experience share their personal experiences, organizational tips, best teaching strategies, and favorite hands-on activities. There really are ways to do things that make life easier - join us for workshop filled with fun, friendship, and Physics. 1st tip is to always go to a workshop that has a make-and-take. (Yes, we will do some make-and-takes.)

Friday, October 19, 2007 3:30PM - 5:30PM –
Session F8 W2: AAPT Scheduled Workshops Heldenfels Hall 217

3:30PM F8.00001 Using PhET Simulations in Your Physics Class , THOMAS O'KUMA, REGINA BARRERA, Lee College, PAUL WILLIAMS, Austin Community College — The Physics Educational Technologies (PhET) project has provided some incredible simulations that can be used in a variety of ways in the high school and college physics classes. This workshop will give the participants a chance to explore some of these simulations, see how they can be used in the classroom or through a website, and how to develop your own uses for the PhET simulations. Some materials will be provided.

Friday, October 19, 2007 3:45PM - 5:21PM –
Session G1 HEN3: High Energy/Nuclear Rudder Tower 701

3:45PM G1.00001 Testing of Edgeless Planar Detectors for the LHC[1] , WILLIAM SPEARMAN, University of Dallas, GENNARO RUGGIERO, CERN — One goal of the TOTEM project at CERN's LHC is to measure protons scattered at very high pseudorapidities. Conventional detectors have very large dead zones making them a non-option for an experiment which requires detection capabilities at about 1 mm from the beam. To overcome the limitations of conventional detectors, edgeless planar detectors were developed which will be placed in special fixtures in the beam pipe known as Roman Pots. To make these detectors edgeless, current terminating structures were used which channel the current generated by electrostatic impurities and the current resulting from the biasing voltage away from the sensitive area. The design and testing of the current terminating capability of these structures, with special regard concerning the effects of radiation on the performance of these silicon detectors, will be discussed.

[1]Special thanks to the National Science Foundation's REU grant to the University of Michigan

3:57PM G1.00002 CMS Endcap Hadron Calorimeter (HE) Response to High Energy Electron and Pions , YOUN ROH, Texas Tech University, NURAL AKCHURIN, Texas Tech Universtiy, SUNG-WON LEE, Texas Tech University, CMS COLLABORATION — The response of the CMS endcap hadron calorimeter to high energy beam will be presented. The data were taken at the H2 beam line at CERN in the summer of 2007 with 10-300 GeV/c pions and electrons. We report on the overall performance of the endcap calorimeters with emphasis on response linearity and energy resolution.

4:09PM G1.00003 Gas Electron Multiplier Prototype Test Beam Studies for International Linear Collider , JACOB SMITH, H. BROWN, C. MEDINA, J. LI, University of Texas at Arlington, K.P. HONG, S.N. KIM, C. HAN, S. PARK, Changwon National University, A. WHITE, J. YU, University of Texas at Arlington, CALICE COLLABORATION — A sampling digital hadron calorimeter (DHCAL) in combination with the Particle Flow Algorithms could provide the high jet energy resolution demanded by the physics goals of the International Linear Collider. UTA's High Energy Physics group has been developing a DHCAL using Gas Electron Multiplier (GEM) technology. GEM consists of multiple layers of copper-clad thin plastic foil each containing micron sized holes. With a high voltage applied across each layer this system amplifies the signal from energy deposits of traversing charged particles from a hadronic shower. In addition, due to the small pitch between the holes, GEM can resolve individual particles in the shower down to the micrometer level. This talk will focus on the development and performance of UTA's double GEM detectors. Results from beam tests at Fermilab's Meson Test Beam Facility will also be presented.

4:21PM G1.00004 Development of a CMS Tier-3 center and HEP computing for LHC physics , CHIYOUNG JEONG, MICAH GATZ, ALAN SILL, SUNG-WON LEE, NURAL AKCHURIN, Texas Tech Univ., CMS COLLABORATION — This presentation will highlight HEP computing efforts made to prepare Texas Tech University to operate a Tier-3 site for the upcoming LHC experiments at CERN. Transferring large amounts of CMS data using the PhEDEX (Physics Experiment Data Export) file transfer system, development of a remote data quality monitoring station for first pass-analysis and processing the CMS data on a HEP cluster at TTU will be discussed.

4:33PM G1.00005 Missing Transverse Energy in events with tau particles at the CMS detector , ALFREDO GURROLA, TERUKI KAMON, CHI-NHAN NGUYEN, ALEXEI SAFONOV, Texas A&M University, CMS COLLABORATION — The Large Hadron Collider (LHC) is expected to probe new physics beyond the Standard Model. A characteristic feature of new physics signals at the LHC will be the presence of large missing transverse energy (MET). Furthermore, our ability to fully reconstruct the Higgs mass in the di-tau decay channel is very sensitive to the measurement of the missing energy. Thus, it becomes extremely important to measure the missing energy accurately and with good precision. We overview the current status of MET measurements at the CMS detector, and present a method for improving this measurement in events with hadronically decaying taus.

4:45PM G1.00006 Database for the PHENIX RPC Factory , TIMOTHY JONES, Abilene Christian University, PHENIX COLLABORATION — The Pioneering High Energy Nuclear Interaction Experiment (PHENIX) is located on the Relativistic Heavy Ion Collider (RHIC) ring at Brookhaven National Laboratory. One of the goals of RHIC is to discover the origin of the proton spin. Resistive Plate Chambers (RPCs) will be used at PHENIX as a level 1 trigger to select single high transverse momentum muon events from a large background of low transverse momentum muon events. During the assembly of the RPCs, we will be keeping track of information from quality control tests, performance tests and the position each RPC will occupy in the detector. This information will be used for calibrations after the RPCs are installed in PHENIX. Therefore, the information needs to be organized and stored in such a way that it can easily be accessed over the next several years. This will be done through the use of a database that will be accessed both by a program which inputs data automatically from a number of systems and by a web interface that will be used both to input information and access that information at a later date. The structure of the database will be presented as well as the methods that will be used to input the information.

4:57PM G1.00007 Electron identification at STAR and the Barrel Preshower detector , MATT CERVANTES, Texas A&M Cyclotron Institute, STAR COLLABORATION — The Barrel Electromagnetic Calorimeter (BEMC) in the STAR experiment at RHIC is a sampling lead scintillator consisting of 4800 towers. The data from the first 2 layers of each tower is read out separately and formally defines the Barrel Preshower (BPRS) detector. The BPRS distinguishes between electrons developing a shower early in the calorimeter tower as opposed to interactions that occur beyond these first 2 layers. We will report on the commissioning of the BPRS into the STAR detector and its implementation into an electron-based analysis. We present the standard method of particle identification currently used for electron selection and investigate the effect of using the BPRS detector. Comparison of such an analysis with and without the BPRS will be shown.

5:09PM G1.00008 Coil Configurations Study for Bi-2212 Subscale Magnets , CHRISTOPHER ENGLISH, Lawrence Berkeley National Laboratory, SUPERCONDUCTING MAGNET GROUP TEAM — The Superconducting Magnet Group at Lawrence Berkeley National Laboratory is developing subscale superconducting magnets consisting of Bi-2212 (Bi_2-St_2-Ca-Cu_2O_x) racetrack coils as part of its subscale program. Several configurations are being considered: the stand-alone racetrack, subscale common coil, subscale dipole, and subscale hybrid dipole. In order to prepare for the assembly and testing of these magnets, a study has been carried out to determine the short sample current (I_{ss}) and the Lorentz forces for each configuration. OPERA 3D has been used to ascertain the load lines for each subscale magnet. The intersection of these load lines with the engineering critical current density versus magnetic field curve ($J_{EC}(B)$) for Bi-2212 round wire subsequently determined the I_{ss}. The results show little variation in the I_{ss} of each configuration due to the small slope of the $J_{CE}(B)$ in the field range of 5-10 T. The Lorentz forces, also determined with OPERA 3D, have been analyzed by defining the magnetic pressure on the coils. Results from this analysis show that a possible testing sequence for the subscale program could be the stand-alone racetrack, subscale common coil, subscale dipole, and finally the subscale hybrid dipole, in order of increasing magnetic pressure.

Friday, October 19, 2007 7:00PM - 7:45PM —
Session H1 After Dinner Talk: Einstein on Race and Racism Memorial Student Center 224

7:00PM H1.00001 Einstein on Race and Racism, presented by Fred Jerome and Rodger Taylor , FRED JEROME, RODGER TAYLOR — It is little-known that physicist Albert Einstein strongly held the view that "Racism is America's worst disease." Einstein was active in the fight against racism from the 1930's until his death in 1955. Included among his friends were a number of important Afro-American figures, including the educator W.E.B. DuBois, the actor and basso profundo singer Paul Robeson, and the soprano Marian Anderson. Based on the authors' work "Einstein on Race and Racism."

Saturday, October 20, 2007 9:00AM - 10:30AM —
Session I1 Invited Session: Smoliar and Baker Rudder Tower 601

9:00AM I1.00001 Starting a Photonics Company After the Telecom Meltdown , LAURA SMOLIAR, Mobius Photonics — The story of Mobius Photonics, Inc. is the story of a top-notch team of physicists and engineers who saw an opportunity to leverage the enormous investments made during the telecom boom in semiconductor diodes and optical fiber and deploy them in fiber-based light sources for a manufacturing sector facing continuing cost and quality challenges. An overview of this rapidly growing industry of "fiber lasers" will be given, and the unique advantages and challenges of a start-up will be addressed.

9:45AM I1.00002 Exciting Prospects and New Experiments in both High Energy and Nuclear Physics , KEITH BAKER, Yale University — One of the most likely venues for new discoveries in particle and nuclear physics is the research program at the Large Hadron Collider (LHC). The first experiments there are expected to commence in about a year. An overview of the machine and the initial experimental apparatus will be given first in this talk. It will be followed by a few specific examples of physics topics that will be studied with them. These serve to highlight the physics case for this large international effort.

Saturday, October 20, 2007 10:40AM - 12:28PM —
Session J1 CM4: Condensed Matter Rudder Tower 401

10:40AM J1.00001 First principles calculations of the thermal properties of tin clathrate materials , EMMANUEL NENGHABI, Texas Tech Univeristy, CHARLES MYLES, Texas Tech University — Using a Local Density Approximation (LDA) approach, we have studied the energetics and the thermal properties (free energy, specific heat, lattice vibrational entropy) of the tin-based Type I semiconductor clathrates Sn_{46}, K_8Sn_{46}, $K_8Sn_{44}M_2$ (M is a Sn vacancy), $Cs_8Ga_8Sn_{38}$ and $Cs_8Zn_4Sn_{42}$. The clathrate lattices are open framework, cage-like structures. Our results predict that K_8Sn_{46} is slightly less stable than $K_8Sn_{44}M_2$, in agreement with other theories.[1] We have optimized the geometry of each structure and have calculated the phonon density of states. The thermodynamic properties have then been calculated as a function of temperature. The localized vibrational ("rattler") modes of the guests Cs and K have been calculated and their Einstein temperatures obtained. The Debye temperatures of each host clathrate have also been calculated. We use our results to help to explain the observed difference[2] in the lattice thermal conductivities of some of these materials.

[1] L. Mollnitz et. al., J. Chem. Phys. 117, 3 (2002)
[2] G. S. Nolas et. al., Phys. Rev. B 53,165201 (2002)

10:52AM J1.00002 Experimental study of $Ba_8Al_xGe_{46-x}$ clathrates by NMR and other techniques[1] , WEIPING GOU, JI CHI, YANG LI, V. GORUGANTI, JOSEPH H. ROSS, JR., Department of Physics, Texas A&M University — Cage-structured group-IV clathrates exhibit interesting properties, for example very high thermoelectric efficiency. We have investigated $Ba_8Al_xGe_{46-x}$, which is a ternary semiconductor for the case $x = 16$. ^{27}Al NMR studies for $x = 16$ show metallic behavior, indicating doping by native defects into the metallic regime. For smaller x the average relaxation rate increases, indicating an increased density of carriers. We also observe vacancies in low-x samples via electron microprobe studies. For $x = 12$ and 13, NMR exhibits a second line not seen for $x = 16$, attributed to Al adjacent to vacancies. Magic angle spinning NMR and computer simulation of the first-order quadrupole line shape for these samples were used to analyze the observed NMR lines. In addition, we have used ab initio calculations of the electric field gradients to match the observed quadrupole broadening with the local structure. Evidence indicates that Al adjacent to vacancies are predominantly on $24k$ sites. These sites have significantly different local electronic structure and smaller density of conduction electrons.

11:04AM J1.00003 NMR measurements of $Al_{20}V_2La$ and $Al_{20}V_2Eu$[1] , HAOYU QIAN, JI CHI, SERGIO Y. RODRIGUEZ, WEIPING GOU, V. GORUGANTI, JOSEPH H. ROSS, JR., Department of Physics, Texas A&M University — The $Al_{20}V_2R$ system, with R = rare earth, features R atoms in 16-atom Al cages. Our previous work on $Al_{20}V_2Eu$ showed the development of underscreened Kondo behavior at low temperatures. From ^{27}Al NMR measurements of nonmagnetic $Al_{20}V_2La$ we identify the local electronic behavior of all three Al framework sites, and T_1 measurements indicate a significant difference between the behavior of two of the sites. At high temperatures, pseudogap behavior is observed, which is also supported by electronic calculations using the WIEN2k package. These calculations are also in excellent agreement with the measured specific heat. We conclude that the spin-fluctuation behavior in $Al_{20}V_2Eu$ results from the rare-earth atom rather than from the Al-V framework. Transport measurements also could be fit to a Bloch-Gruneisen behavior, and by taking the difference, the magnetic contribution to the resistivity of $Al_{20}V_2Eu$ could be identified, including a T-linear magnetoresistance which disappears at about 100 K, along with the apperance of Kondo behavior.

11:16AM J1.00004 Metal-Insulator Transition in thin Gadolinium Films[1] , RAJ V.A. SRIVASTAVA, AARON COLLIER, D.G. NAUGLE, WINFRIED TEIZER, Department of Physics, Texas A&M University, College Station, Texas, 77843-4242. — Two dimensional thin films of gadolinium were prepared in an ultra high vacuum chamber using electron-beam evaporation onto a cold substrate. The percolation limit was reached with the thinnest films, while thicker films show metallic behavior. Electronic measurements were conducted in-situ at low temperatures and nonlinear I-V curves were observed for the thinnest films. Progress in this ongoing study will be presented and applied to a better understanding of metal-insulator transitions in two dimensional disordered systems.

11:28AM J1.00005 Electronic Transport Properties of Mn_{12}-Acetate Film Measured with Self-assembled Tunneling Junction , LIANXI MA, CHI CHEN, GLENN AGNOLET, Texas A&M university — We measure the differential conductance of Mn_{12}-Acetate 2 monolayer film and found it is about 10^{-7}-10^{-8} S. We observed the Kondo resonance and transition from dip to peak as initial resistance decreases. We calculated the Kondo temperature of Mn_{12}-Acetate on the surface of Pt and it is 346±86 K. Sudden conductance change about 1.0×10^{-8} S was observed and as it is highly unlikely caused by mechanical instability, we speculate it is caused by the molecular configuration change between 2 states, which agree with Gregory's assumption.

11:40AM J1.00006 Anomalous Long-Range Proximity Effect Observed in Single-Crystal Superconducting Nanowires[1] , HAIDONG LIU, Texas A&M University, ZUXIN YE, HONG ZHANG, ZHIPING LUO, K.D.D RATHNAYAKA, WENHAO WU, Department of Physics and MIC, Texas A&M University — An anomalous proximity effect has been observed in single-crystal Pb, Sn, and Zn nanowires, each in contact with a pair of macroscopic electrodes. With electrodes having a higher critical temperature Tc, superconductivity is induced at the Tc of the electrodes in Sn and Zn nanowires as long as 60 μm, which is more than 10 times the expected length defined by current theories. This effect is further confirmed by the field dependence of the resistive transitions and I-V characteristics. It is found to depend sensitively on the residual-resistance-ratio of the nanowires.

11:52AM J1.00007 RF Plasma Synthesis: A Novel Technique for Preparation of High Critical Field "Dirty" MgB_2 , MOHIT BHATIA, Accelerator Technology Corp., College Station, TX 77845, TIM ELLIOTT, PETER MCINTYRE, AKHDIYOR SATTAROV, Department of Physics, Texas A&M University, College Station, TX 77843 — It has been shown, both theoretically as well as experimentally, that very high critical fields can be achieved in "dirty" MgB_2 superconductors. However, controlled homogeneous doping/alloying has thus far remained a challenge. A novel technique of rf plasma sputtering of "dirty" MgB_2 is hence being developed. This technique promises a potential for the synthesis of powders with homogeneous doping/alloying in the crystal lattice. Spatial temperature profile in the plasma plume is helpful, especially for the case of MgB_2 where the reacting species have very different vaporizing temperatures. Details of the design concept and preliminary results will be presented.

12:04PM J1.00008 Pinning Enhancement of Tb Doped TFA-MOD YBCO Film[1] , HUI FANG, GAN LIANG, Sam Houston State University, BRANDON HARRISON, PAUL BARNES, Air Force Research Laboratory — In this study, minute rare earth Tb doped YBCO films were prepared by using Trifluoroacetic acid metalorganic deposition (TFA-MOD) method. The precursor solution was deposited on LAO single crystal substrate by using spinning coating method. The epitaxial YBCO films were obtained via a two-step heat treatment. The characterizations of films including microstructure, Tc, field dependent Jc will be reported. The relationship between dopant amount, Jc-H behavior, and microstructure evolution will be discussed.

12:16PM J1.00009 The interaction between superconductors and Mn_{12}-acetate single-molecule magnets[1] , K. KIM, J. MEANS, W. TEIZER, Department of Physics, Texas A&M University — Possible applications of single-molecule magnets (SMMs), e.g. for ultra high density magnetic information storage device, quantum computation, and molecular electronics, have been suggested due to the unusual magnetic behavior. It is an important prerequisite for the applications to develop a reliable technique to organize the molecules on a surface and to detect the magnetic signals of the molecules. A solution evaporation technique combined with conventional lithography is a simple but reliable approach to generate Mn_{12}-acetate thin film patterns on the micro/nano-scale. The miniaturized SQUID is appropriate for sensing the magnetic flux from the film structure of the molecular magnets. A new interesting system, the so-called superconductor/SMM hybrid, results from the experimental configuration. Understanding this new type of hybrid system is important not only because of the expectation of new phenomena affecting on the functionality of superconducting devices, but also because the two coupled substances are fundamentally incompatible phases. In this presentation, the first experimental attempt to understand the interaction between an aluminum superconducting film and Mn_{12}-acetate SMMs will be discussed.

Saturday, October 20, 2007 10:40AM - 11:40AM —
Session J2 CM5: Condensed Matter Rudder Tower 504

10:40AM J2.00001 The Bouncing Jet: A Newtonian Liquid Rebounding off a Free Surface , MATTHEW THRASHER, University of Texas at Austin, SUNGHWAN JUNG, YEE KWONG PANG, CHIH-PIAO CHUU, HARRY L. SWINNEY — We find that a liquid jet can bounce off a bath of the same liquid if the bath is moving horizontally with respect to the jet. Previous observations of jets rebounding off a bath (e.g. Kaye effect) have been reported only for non-Newtonian fluids, while we observe bouncing jets in a variety of Newtonian fluids, including mineral oil poured by hand. A thin layer of air separates the bouncing jet from the bath, and the relative motion replenishes the film of air. Jets with one or two bounces are stable for a range of viscosity, jet flow rate and velocity, and bath velocity. The bouncing jet phenomenon can be observed in many household fluids using only minimal equipment, making it accessible as a classroom demonstration and a science project.

10:52AM J2.00002 The Study of Water's Interaction With PEG-DM hydrogels through T1 relaxation times , JOSEPH MEIER, University of Dallas, JAMES MANEVAL, ERIN JEBLONSKI, Bucknell University — Polyethylene glycol(PEG), a hydrophilic polymer, is different then poly-propelene glycol(PPG) and polymethylene glycol(PMG) which are hydrophobic. Study of this difference was carried out by empirically determining how water interacts with PEG using a 600 MHz NMR spectrometer to measure T1 relaxation times of water with PEG-dimethacrylate(PEG-DM) hydrogels. The PEG-DM hydrogels were synthesized in a two part reaction involving attaching methacrylic acid to the two ends of the polymer, then cross-linking vinyl groups of the methacylic acid to form a linked matrix of all the PEG-DM molecules. The presentation will cover how the measurements were taken, what can be learned from the T1 relaxation times, and what future studies will entail.

11:04AM J2.00003 The Effect of a Nematic Liquid Crystal Environment on the Alignment of the Conductive polymer MEH-PPV as a Function of Polymer Chain Length , DAVID SOLIS, University of Dallas, ALEXEI TCHERNIAK, Rice University, ANDREW TANGONAN, T. RANDALL LEE, University of Houston, STEPHAN LINK, Rice University, UNIVERSITY OF HOUSTON RANDALL LEE GROUP COLLABORATION — MEH-PPV (poly(2-methoxy, 5 ethyl (2' hexyloxy) para-phenylene vinylene)) is a conductive, highly fluorescent polymer that has important technological applications in photovoltaic devices such as organic solar cells and light emitting diodes. It is known that the polymer conformation can be controlled through the environment in which it is present. By using a nematic liquid crystal solvent, 5CB (4-pentyl-4'-cyanobiphenyl) as a host for the MEH-PPV, we are able to stretch and align the polymer chains along the liquid crystal director to a much greater extent than it is possible in an isotropic solvent. We use single molecule polarization spectroscopy to determine the solute order parameter for the MEH-PPV – 5CB solute-solvent system. Using MEH-PPV samples with different molecular weights, we are able to investigate the dependence of the solute order parameter on the polymer chain length. We observe a decrease in order parameter for shorter polymer chains with the solute order parameter equaling that of the solvent for a single molecule solute (rhodamine 6G).

11:16AM J2.00004 Study of Rubber Composites with Positron Doppler Broadening Spectroscopy: Consideration of Counting Rate , CHUN YANG[1], Centenary College, C.A. QUARLES, Texas Christian University — We have used positron Doppler Broadening Spectroscopy (DBS) to investigate the uniformity of rubber-carbon black composite samples. The amount of carbon black added to a rubber sample is characterized by phr, the number of grams of carbon black per hundred grams of rubber. Typical concentrations in rubber tires are 50 phr. It has been shown that the S parameter measured by DBS depends on the phr of the sample, so the variation in carbon black concentration can be easily measured to 0.5 phr. In doing the experiments we observed a dependence of the S parameter on small variation in the counting rate or deadtime. By carefully calibrating this deadtime correction we can significantly reduce the experimental run time and thus make faster determination of the uniformity of extended samples.

11:28AM J2.00005 Effects of Energetic Ion Particles on Friction of Diamond-Like Carbon[1] , KE WANG, Department of Physics Texas A&M University, HONG LIANG, Texas A&M University, JEAN MICHEL MARTIN, THIERRY LE MOGNE, ECOLE CENTRALE DE LYON LTDS COLLABORATION — We demonstrate that energetic argon ions introduce phase transformation of a diamond-like-carbon film. Inside an ultrahigh vacuum chamber, energetic Ar ions of 5KeV were generated using an X-ray photon spectroscopy. After ion bombardment, the XPS and friction tests were conducted in situ. The ex situ surface morphological analysis using an atomic force microscope and the multiple-peaks deconvolution of the C 1s XPS peak indicate that the changing ratio of sp2 and sp3 hybridization of carbon dominates the film's friction. We conclude that the friction of the DLC film against itself depends on the carbon phase, not the film's surface roughness.

Saturday, October 20, 2007 10:40AM - 12:16PM —
Session J3 AMO3: Atomic, Molecular and Optical Physics Rudder Tower 501

10:40AM J3.00001 Toward molecular switches and biochemical detectors employing adaptive femtosecond-scale laser pulses , ROLAND ALLEN, PETRA SAUER, Texas A&M University — The following topics will be discussed: (1) Cis to trans and trans to cis photoisomerization of azobenzene, with nuclear motion allowing extra electronic transitions for pulse durations > about 50 fs. (2) Photoinduced ring-opening and ring-closing in a model dithienylethene. (3) Response of dipicolinic acid to femtosecond-scale laser pulses, including excited states and nuclear motion (with Yuri Rostovtsev). Our technique is semiclassical electron-radiation-ion dynamics (SERID, in which the radiation field and nuclear motion are both treated classically, and the ion cores are regarded as inert (with only the valence electrons included in the dynamics). Recall, however, that one still observes "n photon" and "n-phonon" processes in a semiclassical treatment. Also, the nuclear motion is treated correctly on reasonably short time scales (e.g., picoseconds). Although real applications (such as molecular switches and biochemical detectors) will involve adaptive techniques – with femtosecond-scale laser pulses whose durations, photon energies, fluences, shapes, etc. are tailored for specific applications – as well as larger systems, one needs an understanding of the rich interplay of electronic and nuclear dynamics to guide more empirical approaches. This understanding can be obtained through detailed studies of the kind reported here. This work was supported by the Robert A. Welch Foundation.

10:52AM J3.00002 Holographic Data Storage with a Digital Micromirror Device , DANIEL BULLOCK, TONI SAUNCY, CHARLES ALLEN, Angelo State University Physics, TIM DALLAS, Texas Tech University Electrical Engineering — A holographic data system writes bits by recording the interference between a reference beam and an object beam containing data as a diffraction grating onto a photosensitive disc. The purpose of this research is to evaluate current designs and consider improvements such as the use of a digital micromirror device (DMD) as a spatial light modulator. Other factors addressed are multiple incident angles for volume layering and improving bit contrast.

11:04AM J3.00003 Mid/Far-Infrared Photoetection via Second-Order Nonlinear-Susceptibility in Semiconductor Heterostructures[1] , ALEKSANDER WOJCIK, FENG XIE, ALEXEY BELYANIN, Texas A&M University — Photodetectors in the mid/far-infrared spectral regions have always presented a challenge stemming from the need to use narrow bandgap materials and inevitably high dark current due to thermal excitations that limit the overall performance of the detector. We propose a nonlinear infrared photodetection scheme based on coherent frequency up-conversion in coupled quantum-well heterostructures, which would permit to take advantage of superior properties of GaAs-based and InP-based materials, and at the same time utilize the well developed photodetector technology at the near-infrared and visible wavelengths. Our analysis includes specific structures and device designs, including the expected performance of such detectors. We show the possibility of single-photon detection in the mid-infrared range with high detection efficiency. We also discuss possibility of monolithically integrating up-conversion detectors with near-IR semiconductor pump lasers, which would yield a compact injection-pumped device.

11:16AM J3.00004 The Measurement and Simulation of Terahertz Difference Frequency Generation in Quantum Cascade Lasers[1] , FENG XIE, Department of Physics, Texas A&M University, MIKHAIL BELKIN, FEDERICO CAPASSO, Department of Engineering and Applied Science, Harvard University, JEROME FAIST, Institute for Quantum Electronics, ETH Zurich — Recently the research on Terahertz (THz) source and imaging has attracted significant attention. To achieve the room-temperature operated semiconductor light source in the THz range became one of the main challenges. Quantum Cascade lasers (QCL) are the primary contenders. However, the goal of achieving room-temperature operation in THz QCLs still remains elusive. Combining optical nonlinearities with a mid-infrared QCL or a near-infrared diode laser is an alternative approach. A device integrating two QCL active cores lasing at different mid-infrared wavelengths and giant second order susceptibility for difference frequency generation (DFG) together could be a promising THz light source. In this talk, the measurement of a THz difference frequency generation QCL is presented. The laser works at two mid-infrared wavelengths, around 9um and 10um. The wavelength of the DFG signal is around 60 um. The result of simulations for the DFG spectra is also presented.

11:28AM J3.00005 Second harmonic generation in the near-infrared range in high conduction band offset heterostructures[1] , YONG HEE CHO, ALEXEY BELYANIN, Department of Physics, Texas A&M University at College Station, College Station, Texas 77843 — It is well known that asymmetric coupled semiconductor quantum wells possess giant optical nonlinearities associated with resonant intersubband transitions. These systems attracted a lot of interest in the last several years due to their unmatched flexibility in design and possibility of integration with optoelectronic devices. At the same time, the spectral range covered by devices based on intersubband nonlinearities has been limited to mid/far-infrared wavelengths due to low conduction band offset in most popular GaAs/AlGaAs and InGaAs/AlInAs material systems. Here we analyze the potential of high conduction band offset heterostructures for efficient second harmonic generation (SHG) in the near-infrared range 1-1.6 μm. We concentrate on $Ga_{0.47}In_{0.53}As/AlAs_{0.56}Sb_{0.44}$ heterostructures that are lattice matched to InP. Their conduction band offset in the Gamma-valley is as high as 1.6 eV. Such quantum wells can be grown on InP substrate; they utilize superior thermal and optical qualities of InP and mature InP technology. We find the optimal asymmetric double quantum well design which maximizes the second-order nonlinearity and discuss the nonlinear conversion efficiency for various geometries.

11:40AM J3.00006 Broadband coherent light generation in a Raman-active crystal driven by two-color femtosecond laser pulses[1] , MIAOCHAN ZHI, ALEXEI SOKOLOV, Dept. of Physics, Texas A&M University — We demonstrate broadband light generation by focusing two-color ultrashort laser pulses into a Raman-active crystal, lead tungstate ($PbWO_4$). As many as 20 Anti-Stokes and 2 Stokes fields are generated due to strong near-resonant excitation of a Raman transition. The generated spectrum extends from infrared, through the visible region, to ultraviolet, and consists of discrete spatially-separated sidebands. Our measurements confirm good mutual spatial and temporal coherence among the generated fields, and open possibilities for synthesis of subfemtosecond light waveforms.

11:52AM J3.00007 Hybrid CARS for Non-Invasive Blood Glucose Monitoring , XI WANG, DMITRY PESTOV, AIHUA ZHANG, ROBERT MURAWSKI, ALEXEI SOKOLOV, GEORGE WELCH, Institute for Quantum Studies and Physics Department, Texas A&M University, JAAN LAANE, Department of Chemistry, Texas A&M University, MARLAN SCULLY, Institute for Quantum Studies and Physics Department, Texas A&M University, INSTITUTE FOR QUANTUM STUDIES AND PHYSICS DEPARTMENT, TEXAS A&M UNIVERSITY TEAM, DEPARTMENT OF CHEMISTRY, TEXAS A&M UNIVERSITY TEAM — We develop a spectroscopy technique that combines the advantages of both the frequency-resolved coherent anti-Stokes Raman scattering (CARS) and the time-resolved CARS. We use broadband preparation pulses to get an instantaneous coherent excitation of multiplex molecular vibration levels and subsequent optically shaped time-delayed narrowband probing pulse to detect these vibrations. This technique can suppress the nonresonant background and retrieve the molecular fingerprint signal efficiently and rapidly. We employ this technique to glucose detection, the final goal of which is accurate, non-invasive (i.e. painless) and continuous monitoring of blood glucose concentration in the Diabetes diagnosis to replace the current glucose measurement process, which requires painful fingerpricks and therefore cannot be performed more than a few times a day. We have gotten the CARS spectra of glucose aqueous solution down to 2 mM.

12:04PM J3.00008 Using UV Illumination to Mitigate Excess Charge on Optics in Vacuum[1] , MARK GIRARD, DENNIS UGOLINI, Trinity University — We have studied UV illumination techniques to remove excess surface charge from fused silica optics. We commissioned and calibrated a commercial Kelvin probe to measure the surface potential of charged optics in vacuum. Using a Xenon light source and a monochromator, we directed UV light at the sample and were able to remove the excess charge. We determined that the discharging rate scaled linearly with the intensity of the light and the charge density on the surface. By varying the wavelength of the light, we saw a peak discharge rate at 215nm in both uncoated and coated optics.

Saturday, October 20, 2007 10:40AM - 12:16PM —
Session J4 HEN4: High Energy/Nuclear Rudder Tower 701

10:40AM J4.00001 Cosmic gamma-ray background anisotropies due to supersymmetric dark matter annihilation , SHELDON CAMPBELL, Texas A&M University — One favored candidate for the dark matter in the universe is the lightest supersymmetric particle (LSP) in R-parity conserving supersymmetric extensions of the standard model of particle physics. Although stable against decay, the LSPs annihilate with one another and produce gamma-rays. Because of the large scale distribution of dark matter, anistropies in the gamma-ray background would trace the universe's large scale structure. This talk will summarize the halo model of large scale structure, present the predicted anisotropies due to dark matter annihilation in some supersymmetry models, and discuss the prospects for these anisotropies to be detected by future telescopes such as GLAST.

10:52AM J4.00002 Impacts of Supercritical String Cosmology at LHC , ABRAM KRISLOCK, BHASKAR DUTTA, TERUKI KAMON, DIMITRI NANOPOULOS, ALFREDO GURROLA, Texas A&M University — Supersymmetry (SUSY) is a leading particle physics theory to provide a solution to the amount (23%) of the mysterious dark matter of the Universe. However, recently proposed Supercritical String Cosmology (SSC) alters the determination of the amount of the dark matter in SUSY models. As such, the allowed SUSY parameter space is staggeringly different. Thus, the SSC signals at the LHC are different from conventional SUSY signals. We characterize the SSC signals and study the discovery prospects at the LHC.

11:04AM J4.00003 Dark Matter Content in Q-Cosmology and Its Detectability in Anisotropy of Cosmic Gamma-Ray Spectra , PHUONGMAI TRUONG, BHASKAR DUTTA, SHELDON CAMPBELL, ABRAM KRISLOCK, Texas A&M University — Dissipative Liouville cosmology (Q-Cosmology) introduces the effect of the dilaton field and central charge deficit on relic density of cold dark matter (CDM). The result is a reduction factor of 10 of the relic density, as compared to the value obtained in ordinary cosmology (Lahanas et al, 2007). Since dark matter particles are weakly interacting, annihilation can only occur in regions with high density, such as dark matter halos. Previous works on the anisotropy of the cosmic gamma-ray background (CGB) have shown that dark matter annihilation can be separated from the known background in the anisotropy data (Endo, Komatsu, 2007). In this talk, we first explain the dark matter content of the universe in Q-Cosmology and then study the detectability of this new model in the anisotropy of the cosmic gammy-ray spectra.

11:16AM J4.00004 Constraining properties of rotating neutron stars with nuclear data from terrestrial laboratories[1] , PLAMEN KRASTEV, BAO-AN LI, AARON WORLEY, Texas A&M University-Commerce — Abstract: Nuclear reactions with radioactive beams provide unique means to constrain the equation of state (EOS) of neutron-rich matter, in particular its density dependence through the nuclear symmetry energy. The EOS is important for our understanding of numerous phenomena in both nuclear physics and astrophysics. In this talk we will present our most recent results on the properties of rotating neutron stars with a particular emphasis on rapid rotations. The available constraints on the nuclear symmetry energy around saturation density restrict the possible rotating neutron-star configurations.

11:28AM J4.00005 Equation of state of isospin-asymmetric nuclear matter in relativistic quantum hadrodynamics with chiral limits , WEI-ZHOU JIANG, BAO-AN LI, Texas A&M University-Commerce, LIE-WEN CHEN, Shanghai Jiao Tong University — The Equation of State (EOS) of isospin asymmetric nuclear matter plays a crucial role in many important issues in astrophysics, the structure of exotic nuclei and the reaction dynamics of heavy-ion collisions. Using in-medium hadronic properties according to the Brown-Rho scaling due to the chiral symmetry restoration at high densities and considering naturalness of the coupling constants, we have constructed several relativistic mean-field (RMF) Lagrangians with chiral limits. The scalings and associated parameters that describe the in-medium hadronic properties are consistent with those from microscopic calculations or those extracted from recent experimental data. The resulting equations of state are used to produce a heavier maximum neutron star mass around twice solar mass consistent with recent observations. A satisfactory description for ground-state properties of finite nuclei is also achieved with these RMF models. Meanwhile, the asymmetric matter densities produced by these models are applied to calculate the in-medium NN cross sections at high energies in the relativistic impulse approximation. Furthermore, due to the importance of the Fock terms, an extension to the relativistic Hartree-Fock framework is expected for the current RMF models.

11:40AM J4.00006 Towards a Nuclear Parameter Calculation for Astrophysical Applications
, A. SAMANA, C. BARBERO, S. DUARTE, A. DIMARCO, F. KRMPOTI, Texas A&M University-Commerce — We evaluate the electronic neutrino-nucleus cross section within the context of a nuclear gross theory. We adopt an improved version of the gross theory of β-decay with a new trend for the theoretical parameter representing the energy spread of Gamow-Teller resonance by the spin-dependence part of the nuclear force within this model is obtained. A first application of this calculation is made in the region of nuclei involved in pre-supernova collapse where a comparison with available experimental results can be done ($A < 70$). The obtained results agree with previous evaluations within other microscopic models. Present formalism can be extended to the region $A > 70$ and offers an useful tool to perform nuclear calculations of neutrino capture cross section and β-decay rates for r-process nucleosynthesis within supernova neutrino wind environment.

11:52AM J4.00007 Comprehensive investigation of statistics of gauge groups of weakly coupled free fermionic heterotic strings, MATTHEW ROBINSON, GERALD CLEAVER, Baylor University — We systematically and comprehensively study the statistics of the spectrum of gauge groups of the weakly coupled free fermionic heterotic region of the string landscape. Specifically, we are seeking to generate all possible gauge group sectors for consistent models containing free fermions of any order boundary conditions (beginning with order-2) and study the statistics of the gauge groups contained therein. For example, the initial order-2 investigation will yield the entire gamut of possible stringy ways of breaking SO(44) to SO(2n) $\otimes \ldots \otimes$ SO(2m) tensor groups. Gauge group sectors with higher order fermions will produce generic breakings of SO(44) to tensor products containing SO(2n), SU(m), and $E_{6,7,8}$ factors.

12:04PM J4.00008 Heterotic models with vanishing one-loop cosmological constant and possibly perturbatively broken supersymmetry, GERALD CLEAVER, Baylor University, A. FARAGGI, ELISA MANNO, CRISTINA TIMIRGAZIU, University of Liverpool — It has been assumed that in a given string model there should exist all-order supersymmetric solutions to the F and D flatness constraints. This arises from analysis of point quantum field theories, for which if supersymmetry is preserved at the classical level (tree-level in perturbation theory), an index theorem forbids supersymmetry breaking at the perturbative quantum level. Therefore, in point quantum field theories supersymmetry breaking may only be induced by non-perturbative effects. We present a weak coupled free fermionic heterotic model that utilizes boundary conditions that are both symmetric and asymmetric in the basis vectors that break SO(10) to SO(6)$\otimes$SO(4), with respect to two of the twisted sectors of the $Z_2\otimes Z_2$ orbifold. The consequence is that two of the untwisted Higgs multiplets, associated with two of the twisted sectors, are projected from the massless spectrum. As a result, the string model contains a single pair of untwisted Higgs doublets. In the process of seeking such a model with a phenomenologically viable supersymmetric flat direction we arrive at the unexpected conclusion that the model may not contain perturbative all-order supersymmetric flat directions. In the least, this model appears to have no D-flat directions that can be proven to be F-flat to all order, other than through order-by-order analysis.

Saturday, October 20, 2007 10:40AM - 12:28PM —
Session J5 AS2: Astrophysics, Space Physics, Astronomy and Cosmology Rudder Tower 510

10:40AM J5.00001 Colliding Branes and Formation of Spacetime Singularities, ANDREAS TZIOLAS, ANZHONG WANG, Baylor University, GRAVITATION, COSMOLOGY AND ASTROPARTICLE GROUP TEAM — We construct a class of analytic solutions with two free parameters to the five-dimensional Einstein field equations, which represents the collision of two timelike 3-branes. We study the local and global properties of the spacetime, and find that spacelike singularities generically develop after the collision, due to the mutual focus of the two branes. Non-singular spacetime can be constructed only in the case where both of the two branes violate the energy conditions.

10:52AM J5.00002 Cosmology of Orbifold Branes in Superstring, PREET SHARMA, Physics Department, Baylor University — In recent years, some attempts have been made to derive a late time accelerating universe from a fundamental theory of particle physics that incorporates gravity, lime M-theory or Superstring theory. We study the brane scenario in Superstring theory and see how the Orbifold branes collide.

11:04AM J5.00003 A Time-Symmetric Model of Cosmology, LIONEL HEWETT, Texas A&M University-Kingsville — By considering the symmetry of time surrounding the creation event, a simplified model of cosmology can be constructed that is consistent with current observations of our universe without resorting to the inflationary hypothesis of conventional cosmology. This talk outlines the derivation of this Time-Symmetric Model and illustrates how its predictions are confirmed through numerous modern astronomical observations - including the recently discovered accelerating universe.

11:16AM J5.00004 Supernova Cosmology and Wavelet Decomposition[1], ANDREW WAGERS, LIFAN WANG, Texas A&M University, STEVE ASZTALOS, Lawrence Livermore National Lab, and Lawrence Berekely National Lab — The acceleration of the universe is a very recent development in the field of cosmology. One of the main ways of probing the dark energy that is believed to be causing this accelerations is by studying the properties of type Ia supernovae, namely their redshift and distance. The goal of this work s to build on current supernovae template spectra using the á trous wavelet decomposition. After normalizing the results specific spectral features of several different supernovae are compared. Several of these features have a well defined evolution over the course of the explosion. Relationships between stretch and the spectral index can be found and then used to construct new supernovae template spectra.

[1]Some of this work was done for NSSI program and PAT Directorate at LLNL.

11:28AM J5.00005 Reheating of the universe after inflation with f(phi)R gravity, YUKI WATANABE, Department of Physics, University of Texas, Austin, EIICHIRO KOMATSU, Department of Astronomy, University of Texas, Austin — We show that reheating of the universe occurs spontaneously in a broad class of inflation models with $f(\phi)R$ gravity (ϕ is inflaton). The model does not require explicit couplings between ϕ and bosonic or fermionic matter fields. The couplings arise spontaneously when ϕ settles in the vacuum expectation value (vev) and oscillates, with coupling constants given by derivatives of $f(\phi)$ at the vev and the mass of resulting bosonic or fermionic fields. This mechanism allows inflaton quanta to decay into any fields which are not conformally invariant in $f(\phi)R$ gravity theories.

11:40AM J5.00006 Emergence of Fractal Geometry in One-Dimensional Models of the Expanding Universe[1] , BRUCE MILLER, Texas Christian University, JEAN-LOUIS ROUET, EMMANUEL LE GUIRRIEC, Universite d'Orleans — Concentrations of matter in the universe, such as galaxies and galactic clusters, originated as very mall density fluctuations in the early universe. The primordial fluctuation spectrum is revealed by studies of the angular correlation of CMB across the sky with WMAP. The existence of super-clusters and voids suggests that a natural length scale for the matter distribution may not exist. A point of controversy is whether the distribution is fractal and, if so, over what range of scales. The source of fractal behavior is the lack of a length scale in the two body gravitational interaction. Even with new, larger, sample sizes from recent surveys, it is difficult to extract information concerning fractal properties with confidence. Similarly, simulations with a billion particles only provide a thousand particles per dimension, far too small for accurate conclusions. With one dimensional "toy models" we can overcome these limitations by carrying out simulations with on the order of a quarter of a million particles without compromising the computation of the gravitational field. Here we present the recent results of our ongoing investigation of the emergence of fractal geometry in one dimensional models of the expanding universe.

11:52AM J5.00007 Dark energy and cosmic curvature: Monte-Carlo Markov Chain approach , QIANG WU, Deparment of Physics, Baylor University, TX, YUNGUI GONG, College of Electronic Engineering, Chongqing University of Posts and Telecommunications, Chongqing, China, ANZHONG WANG, Deparment of Physics, Baylor University, TX — We use the Monte-Carlo Markov Chain method to explore the dark energy property and the cosmic curvature by fitting two popular dark energy parameterizations to the observational data. The new 182 gold supernova Ia data and the ESSENCE data both give good constraint on the DE parameters and the cosmic curvature for the dark energy model $\omega_0 + \omega_a z/(1 + z)$ The cosmic curvature is found to be $\Omega_k \leq 0.03$ For the dark energy model $\omega_0 + \omega_a z/(1 + z)^2$ the ESSENCE data gives better constraint on the cosmic curvature and we get $\Omega_k \leq 0.02$.

12:04PM J5.00008 Quasars with a Kick[1] , ERIN BONNING, Southwestern University/UT Austin, GREG SHIELDS, SARAH SALVIANDER, UT Austin — Mergers of spinning black holes can result in the final black hole receiving a 'kick' from gravitational radiation of up to several thousand km/s. A recoiling super-massive black hole in an AGN can retain the inner part of its accretion disk, providing fuel for continuing activity. A search for evidence of such kicks in AGN spectra from the Sloan Digital Sky Survey (SDSS) leads us to place upper limits on the incidence of high velocity recoils in AGN. Other observational signatures will be discussed, including brief flares in soft X-rays that may occur when marginally-bound material falls back onto the moving accretion disk.

12:16PM J5.00009 The Effectiveness of Using Type Ia Supernovae as Standard Candles in the Infrared , SAM GOODING, Texas A&M University — Using observations of 20 Type Ia supernovae obtained over the past 3 years by the Carnegie Supernova Project collaboration at the Las Campanas observatory in Chile, along with results from previously studied Type Ia supernovae, I will present Hubble diagrams and derived absolute magnitudes at maximum brightness for the objects that have well observed lightcurves in the near-infrared. Type Ia supernovae at maximum light appear to be standard candles in the near-infrared to a precision of $+/-0.15$mag or better.

Saturday, October 20, 2007 10:40AM - 12:04PM —
Session J6 AAPTCOLL: AAPT College Teaching Rudder Tower 707

10:40AM J6.00001 Franck-Hertz Classic Experiment Automatization for the Modern Physics Laboratory , MIGUEL BENCOMO, RODRIGO GAMBOA-GOÑI[1], MIGUEL CASTRO-COLIN, Department of Physics, UT El Paso, El Paso TX 79968 — We will present a setup of the classic experiment developed by James Franck and Gustav Hertz using the software LabView. As in the classic experiment a cathode is heated producing electrons which are accelerated by an accelerating voltage, instead of the Mercury vapor used by Franck and Hertz we will deal with Neon. We will look at the spectral response of the Neon as a function of filament current in the electron gun. The automatization of the experiment will allow the users to explore details of the experiment that otherwise are easily hidden by technical complications that arise during experimentation.

[1]Now at Dept. Of Applied Science, UC Davis, Davis CA 95616

10:52AM J6.00002 Assessing Critical Thinking , BETH THACKER, Texas Tech University — Based on the basic features of cognitive structure, it is possible to write an operational definition of critical thinking for use in assessment and in the development of assessment instruments. We discuss the need to assess critical thinking skills, in addition to content knowledge, problem solving and other skills, and the need for the inclusion of this type of assessment in the evaluation of changes in instructional methods and the comparison of classes taught by different instructional methods.

11:04AM J6.00003 Relativity and the standing electromagnetic wave , L.G. SIMS, Retired — This PowerPoint presentation attempts to answer 4 questions. What could cause the effects of Relativity? Why do these effects depend only on the relative velocity between the observer and the object? Are these effects real or only apparent? Is there anything that can be used to physically illustrate these effects? In the presentation I will discuss a standing electromagnetic wave moving past an observer. The observer sees that the effects of relativity on the standing wave are caused by the Doppler Effect on the two waves creating the standing wave.

11:16AM J6.00004 How Batteries Fail , WAYNE SASLOW, Texas A&M University — Batteries are series and/or parallel sets of individual voltaic cells, each characterized by an emf (electromotive force) and an internal resistance. A voltaic cell, with two electrodes separated by ion-containing electrolyte, supports chemical reactions at each electrode-electrolyte interface, involving ions in the electrolyte and both atoms and electrons in the electrode. The chemical reactions drive an electric current, and are responsible for the cell emf (electromotive force). Moreover, ions in the electrolyte are largely responsible for the electrolyte conductance, which determines the internal resistance. As the cell discharges, the ion density decreases, causing a rate of decrease of the conductance proportional to the current. A simple model that treats the ion density as always uniform can explain numerous aspects of the discharge curves (current vs time or current vs total discharge), including the precipitous fall in current when the internal resistance becomes comparable to the load resistance.

11:28AM J6.00005 An Analysis of Acceleration in Projectile Motion , JOHN HARPER, Angelina College — Examination of the normal and tangential components of a projectile in free fall in comparison to the net downward acceleration relates to several concepts that are often mentioned briefly if at all in introductory courses. This may not be part of course material but can be an interesting resource for explaining projectile behavior.

11:40AM J6.00006 Physics in "Polymers, Composites, and Sports Materials" an Interdisciplinary Course[1] , ERIC HAGEDORN, MILIJANA SUSKAVCEVIC, UTEP Physics — The undergraduate science course described uses the themes of polymers and composites, as used in sports materials, to teach some key concepts in introductory chemistry and physics. The course is geared towards students who are interested in science, but are still completing prerequisite mathematics courses required for science majors. Each class is built around a laboratory activity. Atoms, molecules and chemical reactions are taught in reference to making polyvinyl acetate (white glue) and polyvinyl alcohol (gel glue). These materials, combined with borax, form balls which are subsequently used in physics activities centered on free-fall and the coefficient of restitution. These activities allow the introduction of kinematics and dynamics. A free fall activity involving ice pellets, with and without embedded tissue paper, illustrates the properties of composites. The final series of activities uses balls, shoes, racquets and bats to further illustrate dynamics concepts (including friction, momentum and energy). The physical properties of these sports objects are discussed in terms of the materials of which they are made. The evaluation plan to determine the effectiveness of these activities and preliminary results are also presented.

11:52AM J6.00007 A Lab Activity Investigating Newton's Third Law , THOMAS O'KUMA, Lee College — A typical MBL-type laboratory activity for student investigation of Newton's Third Law will be reported. Student's responses to a number of questions to check their understanding as they go through the activity will be presented.

Saturday, October 20, 2007 10:40AM - 12:40PM —
Session J7 SPS: SPS Outreach Education and Student Research Rudder Tower 301

10:40AM J7.00001 Low Level Measurements using the Van der Pauw Technique[1] , MARSHALL PREAS, KUNAL BHATNAGAR, ALEXY VOLKOV, TONI SAUNCY, Angelo State University — As part of the MANDE NSF REU program[1], this project aimed at developing a system to be used for determining electrical resistance in a bulk material or thin film. While a standard two probe technique is sufficient for some low-resistivity samples, the four probe Van der Pauw method is preferred for the materials we wish to study. An automated data acquisition system with geometric corrections was designed utilizing a suite of meters and sources and utilizing LabVIEW^{TM} programming software and GPIB interfacing techniques.

10:52AM J7.00002 Plasmas via computer simulations , VICTOR BAUTISTA, ANDREW WALLACE, Angelo State University — One of the behaviors of plasma is that they sometimes act like a collection of individual particles. Our purpose was to study how one charged particle in plasma behaves in a self-consistent electric field and external uniform magnetic field. We did this by setting up a self-consistent algorithm that given initial position and velocity coordinates of an ion, calculates the electric field and Lorentz force on the ion. This force changes the velocity and coordinates of the ion. These new coordinates are used to calculate a new electric field and update the Lorentz force. New coordinates are calculated and this algorithm is repeated. Results were then plotted for several initial conditions. Both synchronous motion and chaotic motion were found for particular values of magnetic field.

11:04AM J7.00003 Preliminary results of porous silicon synthesis by a non-contact method[1] , KRISTIN PETERSON, TONI SAUNCY, Angelo State University, TIM DALLAS, MARK GRIMSON, Texas Tech University — The goal of this work is to produce porous silicon (p-Si) thin films on n-type and p-type crystalline Si substrates with various dopant types by using a light-induced hydrofluoric acid (HF) synthesis technique. The samples were treated using an expanded beam of a He-Ne laser to produce a localized electric field on bulk crystalline silicon while the samples were immersed in hydro-fluoric acid for varying amounts of time. Samples are now being analyzed by photoluminescence spectroscopy to determine if there is visible light emission, which is characteristic of p-Si. In addition, pore size was estimated by examining SEM micrographs, which indicate pore wall thicknesses on the order of one micron, with a typical pore size of two microns or less. The physical structure and size of the porous regions were found to vary with the concentration and dopant type of the crystalline Si wafer. In contrast to previous published reports, only the side of the sample illuminated with the He-Ne beam during HF synthesis was found to produce the porous thin film.

11:16AM J7.00004 The Society of Physics Students Summer Internship Program , MEAGAN SALDUA, Angelo State University, KENDRA RAND, Society of Physics Students National Office, JESSICA CLARK, American Physical Society — The Society of Physics Students (SPS) National Office provides internships to undergraduate physics students from around the nation. The focus of these internships ranges from advanced research to outreach programs, including positions with the SPS National Office, the APS, the AAPT, NASA or NIST. I will present my "D.C." experience as a first-time intern and my work at the American Center for Physics in College Park, MD. My position with the APS was in the PhysicsQuest program, where I focused on developing educational kits for middle school classrooms. These kits are made available to teachers at no charge to provide resources and positive experiences in physics for students. The impact of the internship program as well as the theme and experiments of this year's PhysicsQuest kits will be detailed.

11:28AM J7.00005 Calibration and Alignment of a High Resolution Spectrometer for FRXL and RSX Plasma Experiments , JENNIFER HENDRYX, Angelo State University, GLEN WURDEN, LEONID DORF, THOMAS INTRATOR, XUAN SUN, LANL, MFE TEAM — Measurements of ion temperature and plasma flow are important for better understanding of laboratory plasmas. Plasmas are the key to production of nuclear fusion, and plasma diagnostics are essential for experimental plasma studies. Spectroscopy in particular is useful in analyzing plasma temperature, flow, and impurity content. It utilizes spectral lines' widths, intensities, and locations in the spectrum to determine elements present in the plasma, as well as line shifting and broadening that occur, for example, due to ion thermal motion—Doppler broadening. I assembled and calibrated a 0.5 meter ARC VM505 spectrometer, combined with a 1024x1024 element gated intensified PI-MAX camera as a detector, to view plasma light from the RSX and FRX-L experiments in the P-24 Plasma Physics group. With a 1200 line/mm grating, the resolution FWHM is 0.03 nm, and I was initially able to collect data looking at the 486.1 nm deuterium beta line.

11:40AM J7.00006 Angelo State Physics Peer Pressure Team: Road Tour 2007[1] , JAMES MATTHEWS, TONI SAUNCY, Angelo State University — The Angelo State University Society of Physics Students chapter has a strong history of science outreach to the local community. For the second year, the outreach team has undertaken a week-long trip visiting middle school teachers and children and presenting physics demonstrations in the greater West Texas region. The goal of the outreach program is to informally educate and excite students about physics and science in general. The demonstrations vary from simple hands on demonstrations to more complicated experiments that most public school science teachers do not have resources to present. Each presentation engages student volunteers to help out with some of the demonstrations. Many of the demonstrations are based around concepts of static and dynamic pressure and how it affects our everyday life. The results have been overwhelming as the subsequent requests for further visits are too numerous for us to accommodate.

[1]This project is supported by an Angelo State University President's Circle Award

11:52AM J7.00007 Exoplanets, Pov-Ray, and E.T. , BILLY QUARLES, Stephen F. Austin State University — No Abstract.

12:04PM J7.00008 Photometry of the Minor Planet 349Dembowska , KITTIKUL KOVITANGGOON, Stephen F. Austin State University — No Abstract.

12:16PM J7.00009 Flywheel Energy Storage Systems , AYRRIC JONES, Stephen F. Austin State University — No Abstract.

12:28PM J7.00010 Using Fourier Coefficients to Determine Metallicity of RR Lyrae Stars[1] , PAMELA VO — Fourier decompositions were performed on the light curves of RR Lyrae stars observed using the Michigan State Observatory telescope and SDSS' Apache Point telescope. The relationship between metallicity and Fourier coefficients was then examined in the g' filter.

[1]Many thanks to Dr. Horace Smith and Nathan de Lee from Michigan State University.

Saturday, October 20, 2007 10:40AM - 12:40PM —
Session J8 W3: AAPT Scheduled Workshops   Heldenfels Hall 219

10:40AM J8.00001 Quintessential Quarknet , EVELYN RESTIVO, Maypearl High School — The QuarkNet Fellows have determined that "SCIENCE IS A PATHWAY, NOT A DESTINATION." The pursuit of science is a collaboration that transcends all sociological boundaries where discoveries are validated by consensus. The QQ workshop will provide information that will identify questions, which will be addressed by the LHC and share activities that are being developed specifically for teaching the physics of the LHC.

Saturday, October 20, 2007 10:40AM - 12:40PM —
Session J9 W4: AAPT Scheduled Workshops   Heldenfels Hall 208

10:40AM J9.00001 Radiation and Health , ALBERT EVANS, South Texas Chapter of the Health Physics Society, KAREN BLANCHARD, STC-HPS Science Teacher Workshop Committee — This is a shortened version of the Science Teachers' Workshop offered free of charge to primary and secondary teachers at a location of their choice, covering fundamentals of nuclear radiation, natural and man-made sources of radiation, biological effects and risks to health, radioactive waste management, and radiation safety management and regulation. The course includes a hands-on demonstration of use of Geiger Counters, which are given without cost to participants for use in their classes. A CD and notebook of class material are issued to each student. Lunch will be provided.

Saturday, October 20, 2007 11:00AM - 12:00PM —
Session K1 Invited Session: Macri and Katzgraber (in Spanish)   Rudder Tower 601

11:00AM K1.00001 The Physics of Diving , HELMUT KATZGRABER, Department of Physics, ETH — The underwater world, and in particular our oceans, represent a final frontier of exploration. In the past, studying the underwater fauna and flora used to be a dangerous undertaking reserved to professional divers. Technological advances over the last 50 years have given sports divers the opportunity to explore this fascinating world using self-contained underwater breathing apparatuses (SCUBA). Despite these technological advances humans have to cope with an unusual environment: perception is different underwater and there is always a risk of decompression illness due to the ambient pressure. After a brief overview of SCUBA diving, some physical phenomena particular to diving will be presented.

11:30AM K1.00002 How to Measure the Age of the Universe , LUCAS MACRI, National Optical Astronomy Observatory — In this public talk, we will review the different steps followed by astronomers to measure the age of the Universe. In order to achieve this goal, we need to be able to measure precise distances. We will learn about parallax, Cepheid variables, and supernovae explosions. We will also discuss recent discoveries in this area and their implications for the ultimate fate of the Universe.

Saturday, October 20, 2007 12:40PM - 2:40PM —
Session L1 W5: AAPT Scheduled Workshops   Heldenfels Hall 220

12:40PM L1.00001 What's Up There? Well, it's not Superman! , TRINA CANNON, Highland Park High School — Projectiles are interesting and often give reason to go to the big field outdoors. But too frequently, a well planned lesson turns to chaos with students scattering and the rockets lost in the brush because no one watched it come down. Here are some inside lessons that get good results, no lost materials and students stay contained for the critical instruction. This is a great preliminary to the outside experience. This is suitable for all grades interested in projectile motion and the control of variables.

Saturday, October 20, 2007 1:30PM - 3:00PM —
Session M1 Invited Session: Astronomy Rudder Tower 601

1:30PM M1.00001 The Great Observatories: New Windows into the Universe , VY TRAN, Institute for Astronomy, ETH — Since Galileo's time, our ability to study the universe has been driven by our ability to collect light from distant objects. Due to tremendous technological advances in the last few decades, we can now study the most distant galaxies known in the universe. In addition to seeing fainter objects at higher resolution, we can also view the universe at many different wavelengths ranging from gamma rays to radio waves. I briefly review the major advances that have been made with, e.g. the Keck telescope, Hubble Space Telescope, and Wilkinson Microwave Anisotropy Probe (WMAP), and discuss why we need to continue pushing our observational limits by developing and building new telescopes.

2:00PM M1.00002 Probing the Universe in the Infrared with the Spitzer Space Telescope , CASEY PAPOVICH, Steward Observatory, University of Arizona — Nearly all stars in the Universe form deep within clouds of gas and dust. This gas and dust obscures the light emitted from these stars and radiates it as heat in the infrared. I will present a brief history of astronomical observations of infrared light, and I will discuss how we learn about star formation from infrared observations. In particular, I will discuss the Spitzer Space Telescope (the last of NASA's Great Observatories), which is extremely sensitive to the infrared light from faint sources that are otherwise invisible from the Earth. I will focus on several recent results from the Spitzer Space Telescope that have both revolutionized our understanding of how stars form in nearby galaxies and improved our understanding of the formation of the most distant galaxies.

2:30PM M1.00003 How to Measure the Age of the Universe , LUCAS MACRI, National Optical Astronomy Observatory — In this public talk, we will review the different steps followed by astronomers to measure the age of the Universe. In order to achieve this goal, we need to be able to measure precise distances. We will learn about parallax, Cepheid variables, and supernovae explosions. We will also discuss recent discoveries in this area and their implications for the ultimate fate of the Universe.

Saturday, October 20, 2007 4:00PM - 4:45PM —
Session N1 Annual George P. Mitchell Lecture in Astronomy Rudder Tower 601

4:00PM N1.00001 Stardust , DON BROWNLEE — No Abstract.

A

Aars, Christian - B4.5, F6.6
Abanov, Artem - B1.2, B1.5
Adamov, Yury - B1.5
Agnolet, Glenn - J1.5
Ajimo, Jacob - F4.5
Akchurin, Nural - G1.2, G1.4
Alexander, Steve - B6.15, F3.8
Alexander, Steven - B6.17
Ali, Tibra - B3.8
Allen, Charles - J3.2
Allen, Roland - J3.1
Ambia-Garrido, Joaquin - F6.12
Amir, Fatima - F1.7
Anand, A. - B6.21
Anandakrishnan, Sridhar - F4.6
Anderson, Lindsay - B4.4
Apodaca, Karina - F6.10
Ariunbold, Gombojav - B5.2
Ariunbold, Gombojav O. - F3.7
Armstrong, Gwen - B4.1
Arnowitt, Richard - B3.3
Asaadi, Jonathan - B3.4
Asztalos, Steve - J5.4

B

Baker, Keith - I1.2
Balogh, L. - F2.2
Banerjee, Sanjay - F1.5
Bannerman, Travis - B2.5
Barbero, C. - J4.6
Barnes, Paul - J1.8
Barrera, Regina - F8.1
Bautista, Victor - J7.2
Belkin, Mikhail - J3.4
Belyanin, Alexey - J3.3, J3.5
Bencomo, Miguel - J6.1
Benesh, Matthew - F1.1
Bernussi, Ayrton - B6.14
Bhatia, Mohit - J1.7
Bhatnagar, Kunal - J7.1
Biswal, Lisa - B5.3
Blanchard, Karen - J9.1
Bonning, Erin - J5.8
Boopalachandran, Praveen - F4.3
Borchard, Annette - F4.6
Borst, Daniel - F1.6

Bowles, Jeff - B5.1
Bradshaw, Andrew - B6.13
Brautigam, Chad - F4.1
Brown, H. - G1.3
Brownlee, Don - N1.1
Bruntz, Robert - F6.7
Bullock, Daniel - J3.2
Burkett, Peter - F4.6
Burns, Alan - F6.9
Burns, L.R. - B6.12
Burst, James - F1.6
Byeon, Joong - F3.4
Byeon, Joong-Hyeok - F3.3

C

Cai, Tong - B6.1
Camp, Charlie - E2.1, E2.2, E2.3, E2.4
Campbell, Sheldon - J4.1, J4.3
Campisi, Michele - B1.8, F4.2
Cannon, Trina - L1.1
Capasso, Federico - J3.4
Carmona-Reyes, Jorge - F1.1
Carrell, Ken - F6.5
Carreto, Francisco - B6.11
Castro, Jose - B2.2, B2.6
Castro-Colin, Miguel - J6.1
Caufield, R. - B6.21
Cervantes, Matt - G1.7
Chandrasekharan, Sreerenjini - B6.20
Chang, Jun-Tao - F3.2
Chavez, Isaac - B2.3, B2.8
Chen, Chi - J1.5
Chen, Hao-Liang - F6.11
Chen, Lie-Wen - J4.5
Chen, W. - F2.6
Chen, Wei - F2.3, F4.5
Cheng, Kwan - B5.6, F4.5
Chi, Chenglin - B6.1
Chi, Ji - J1.2, J1.3
Chianelli, Russell - B6.9, B6.10
Cho, Yong Hee - J3.5
Choo, Jaebum - F4.4
Choudhuri, Ahsan - B6.6
Chourasia, A.R. - F1.8
Chuu, Chih-Piao - J2.1
Cid, Ximena - F6.14

Clark, Jessica - J7.4
Cleaver, Gerald - B3.7, B3.8, J4.7, J4.8
Cleveland, Michael - F2.1
Coldwell, R.L. - B6.15, F3.8
Collier, Aaron - J1.4
Comanescu, Gelu - B5.1
Cottier, Ryan - F1.7
Craig, David - F6.15

D

Dahiya, J. - B6.21
Dallas, Tim - J3.2, J7.3
Datta, S. - B6.15
Dave, Dipak - B6.4
Davis, J.P. - F3.5
Deaton, J.W. - B6.12, F6.4
Dee, Douglas - B6.19
Deka, Ranjit - F4.1
Deoli, N.T. - B6.12
Dhoubadel, M. - F6.2
Diallo, Souleymane - B1.1
Dienhoffer, Robin - E2.5
Diercks, David - B6.5
Dimarco, A. - J4.6
Dorf, Leonid - J7.5
Douglas, John - B6.3
Duarte, S. - J4.6
Duggan, J. - F6.1
Duggan, J.L. - F6.2, F6.4
Duggan, Jerome - B6.7
Duine, Rembert - B1.3
Dunbar, Kim - F1.3
Duncan, Holly - F7.1
Durrer, William - B6.10
Dutta, Bhaskar - B3.3, J4.2, J4.3

E

Ecton, Phillip - B6.5
Elliott, Tim - J1.7
Elmarhoumi, Nader - F1.7
Engel, Don - E1.2
English, Christopher - G1.8
Estabrook, Wells - B6.1
Evans, Albert - J9.1
Even, Uzi - B2.3, B2.8

F

Faist, Jerome - J3.4
Fanelli, Mike - B4.4
Fang, Hui - B6.3, J1.8
Faraggi, A. - J4.8
Fazleev, N.G. - F1.4
Fisher, Paul - F6.15
Fitzgerald, Rosa - F6.10
Foster, Stephen - B6.15, B6.17
Franklin, Bill - B7.1
Freundlich, A. - F2.5
Frey, Wolfgang - F4.7

G
Gaebler, Philipp - B5.7
Gamboa-Go\~ni, Rodrigo - J6.1
Gao, Hong - B2.2, B2.6
Gatz, Micah - G1.4
Geffert, Paul - B3.2
Geisler, Heike - F1.6, F1.7
Gillis, David - B5.1
Girard, Mark - J3.8
Glyde, Henry - B1.1
Golding, Terry - F1.7
Goncharov, Max - B3.2
Gong, Yungui - J5.7
Gooding, Sam - J5.9
Gorman, Brian - B6.5
Goruganti, V. - F1.2, J1.2, J1.3
Gou, Weiping - J1.2, J1.3
Govani, Jayesh - B6.4, B6.6
Grave de Peralta, Luis - B6.14
Greco, Vincenzo - B3.5
Greenwald, Jared - B3.7
Grimson, Mark - J7.3
Gruber, John - B6.2, B6.19
Gruber, John B. - B6.20
Grun, Jacob - B5.1
Guchhait, Samaresh - B6.3, F1.5
Gupta, Priya - B2.2
Gurrola, Alfredo - B3.3, G1.5, J4.2

H
Hagedorn, Eric - J6.6
Han, C. - G1.3
Handy, Carlos - B6.22
Haneman, Heather - F4.6
Harper, John - J6.5

Harrison, Brandon - J1.8
Hendryx, Jennifer - J7.5
Herschbach, Dudley - A1.1
Hewett, Lionel - J5.3
Hickman, John - F1.8
Holik III, Eddie - F2.4
Holland, O.W. - F6.2
Hong, K.P. - G1.3
Horwitz, James - B4.6, B4.7, B4.8
Hossian, Khalid - B6.7
Hough, David - B4.5
Hoyt, Cad - B6.3
Hu, Zhibing - B6.1
Hulbert, S. - F2.6
Hulet, R.G. - B2.7
Hunt, Emily - F6.15
Huston, Shawn - F1.6
Hwang, Wonmuk - B5.5

I
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FALL 2007 TSAAPT WORKSHOPS

Texas A&M University – October 19-20, 2007

Registration Form (.doc)

Friday, October 19

W1 "How to Survive Your First Five Years of Teaching Physics"
(Heldenfels Room 219, 3:30-5:30 pm)
presented by Carolyn Schoeder, Texas A&M University, Texas Regional Collaborative; Debbie Walker, Montgomery High School; and Holly Duncan, Region 9 Education Service Center
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 experience share their personal experiences, organizational tips, best teaching strategies, and favorite hands-on activities. There really are ways to do things that make life easier – join us for workshop filled with fun, friendship, and Physics. 1st tip is to always go to a workshop that has a make-and-take. (Yes, we will do some make-and-takes.)
Limited to 30 participants – 2 hours

W2 "Using PhET Simulations in Your Physics Class"
(Heldenfels Room 217, 3:30-5:30 pm)
presented by Tom O'Kuma and Regina Barrera, Lee College; and Paul Williams, Austin Community College.
The Physics Educational Technologies (PhET) project has provided some incredible simulations that can be used in a variety of ways in the high school and college physics classes. This workshop will give the participants a chance to explore some of these simulations, see how they can be used in the classroom or through a website, and how to develop your own uses for the PhET simulations. Some materials will be provided.
Limited to 20 participants – 2 hours

Saturday, October 20

W3 "Quintessential Quarknet"
(Heldenfels Room 219, 10:40am-12:40pm)
presented by Evelyn Restivo, Maypearl High School.
The QuarkNet Fellows have determined that "SCIENCE IS A PATHWAY, NOT A DESTINATION." The pursuit of science is a collaboration that transcends all sociological boundaries where discoveries are validated by consensus. The QQ workshop will provide information that will identify questions, which will be addressed by the LHC and share activities that are being developed specifically for teaching the physics of the LHC.
Limited to 25 participants – 1.5 hours

W4 "Radiation and Health"
(Heldenfels Room 208, 10:40am-12:40pm)
presented by Albert E. Evans, Chairman, STW Committee, South Texas Chapter of the Health Physics Society
This is a shortened version of the Science Teachers' Workshop offered free of charge to primary and secondary teachers at a location of their choice, covering fundamentals of nuclear radiation, natural and man-made sources of radiation, biological effects and risks to health, radioactive waste management, and radiation safety management and regulation. The course includes a hands-on demonstration of use of Geiger Counters, which are given without cost to participants for use in their classes. A CD and notebook of class material are issued to each student. Lunch will be provided.
Limited to 30 participants – 4 hours

W5 "What's Up There? Well, it's not Superman!"
(Heldenfels Room 220, 12:40pm-2:40pm)
presented by Trina Cannon, Highland Park High School
Projectiles are interesting and often give reason to go to the big field outdoors. But too frequently, a well planned lesson turns to chaos with students scattering and the rockets lost in the brush because no one watched it come down. Here are some inside lessons that get good results, no lost materials and students stay contained for the critical instruction. This is a great preliminary to the outside experience. This is suitable for all grades interested in projectile motion and the control of variables.
Limited to 24 participants – 3 hours

Texas A&M University

(A) Parking is available in the University Center Garage for $12/day and in the West Campus Garage for $6/day. (B) Surface lots (48 and 62 are closest to Rudder) are not available until Friday night at 6 PM, when they become free. (C) Parking in numbered, handicap, or timed spaces can result in your vehicle being towed at your expense. Please check closely that you are not in one of those spaces.

MILES

Wellborn Rd. (FM2154)

Texas Ave.

Eng. & Phys Buildings

University Dr.

See Close-up Map

Easterwood Airport

Heldenfels Building

George Bush Dr.

① University Center Parking Garage
② West Campus Parking Garage
48 Parking Lot 48
62 Parking Lot 62

Memorial Student Center & Rudder Tower

Campus Close-up Map

University Dr.

Wellborn Rd. (FM2154)

Joe Routt St.

George Bush Dr.

Texas Ave.

Eng. & Phys Buildings

Chemistry Buildings

Heldenfels Building

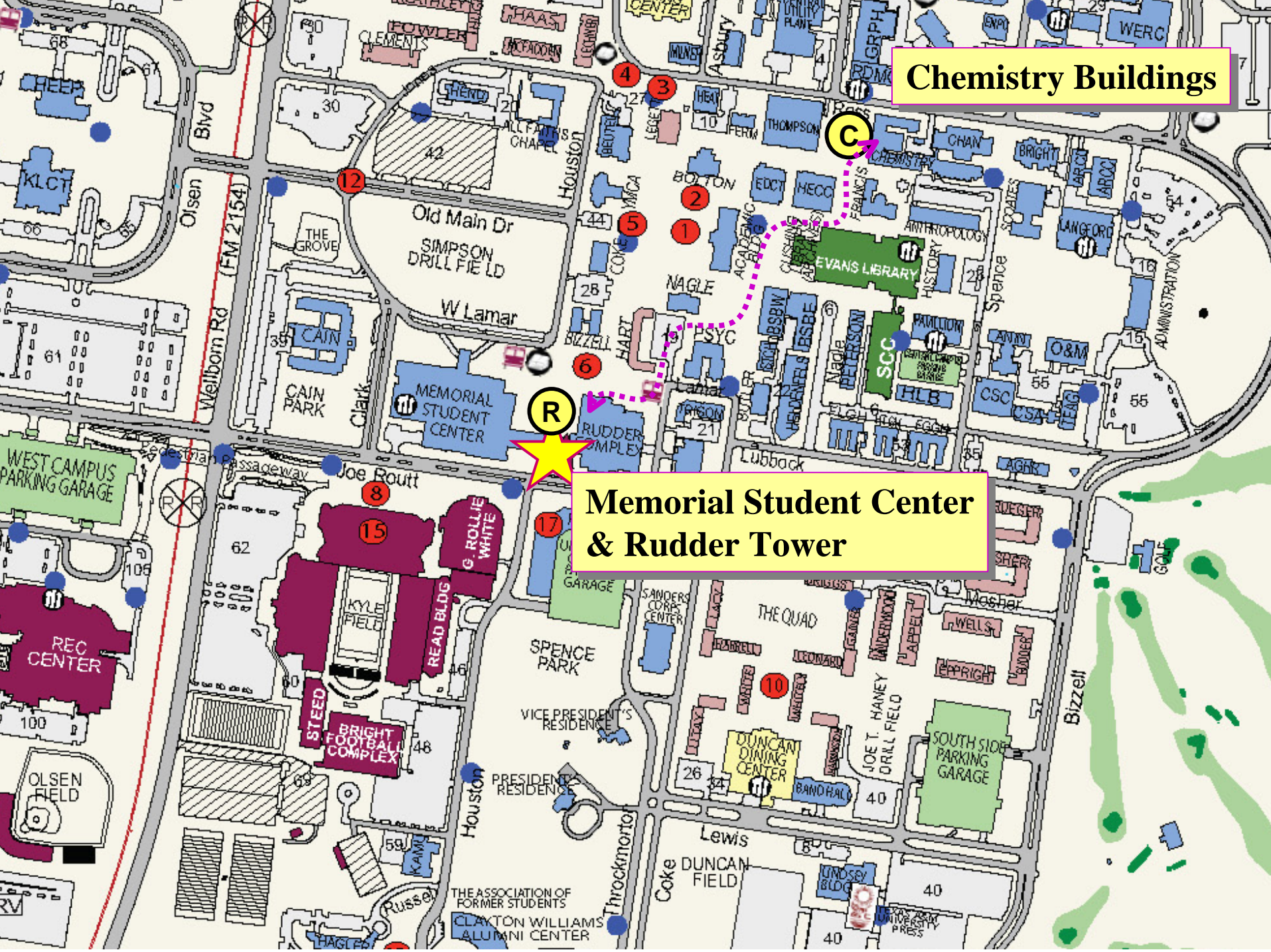**Memorial Student Center & Rudder Tower**

Chemistry Buildings

Memorial Student Center & Rudder Tower

WELCOME TO THE HANDS-ON PHYSICS GALLERY
organized jointly with the
TEXAS MEETING OF APS, AAPT, SPS, NSBP, NSHP

and the
CHEMISTRY OPEN HOUSE AND SCIENCE EXPLORATION

The Department of Physics of Texas A&M University
invites everyone to explore funny, puzzling
Hands-On Physics experiments!
October 20th in Chemistry Building
from 10 am to 3 pm

SQUARE WHEEL BICYCLE
LOW TEMPERATURE SHOW
SPORTS PHYSICS
WATCHING SUN SPOTS
VAN DE GRAAFF GENERATOR
PHYSICS WITH EASTER EGGS
AND MANY OTHERS!

Please come early to solve
a quiz and get a door prize!

Do not miss free Public lectures and
Chemistry Road Shows

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festival@physics.tamu.edu

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