UU2008 Sigma Pi Sigma Congress Abstracts

Saturday November 8, 2008

ARBITRARY GROUPINGS		
Outreach (see also Future Faces of Physics outreach poster abstracts S1-S8 in program, also on Saturday)	**General Physics**	**Astrophysics** (see also Astrophysics poster F6 on Friday)
See abstracts **S9-S18**	See abstracts **S19-S38**	See abstracts **S39-S49**

Outreach

S9. Presenters: Jones, Therese; Fifer, Zachary; Feng, Lu; Noll, Matt; Jani, Karan Pankaj; Czak, Jason

Authors: Jones, Therese; Fifer, Zachary; Feng, Lu; Noll, Matt; Jani, Karan Pankaj; Czak, Jason; Robinett, Richard

Title: Hands-On Outreach Using Everyday Materials

Institution: Penn State, email contact: tmj143@psu.edu

Abstract: In a world full of computers, t.v., and other electronic technology, hands-on activities become a rarity in the classroom. Penn State's Society of Physics Students has compiled a wealth of physics demonstrations that may be performed with everyday materials, from Twizzlers to flour, and have taken the demonstrations on the road to rural areas in hopes of inspiring the next generation of physicists.

S10. Presenter: Lacy Estes

Authors: Lacy Estes, Dr. Toni Sauncy

Title: Angelo State Society of Physics Students Science Outreach: West Texas Road Trip 2008

Institution: Angelo State University, email contact: lacy_estes@hotmail.com

Abstract: The Angelo State Society of Physics Students readily embraces the opportunity to give back to the community. For the past three years, the ASU Peer Pressure Team has presented science demonstrations to elementary and junior high students in the West Texas area. The annual week-long trip involves college students seeking to inspire a younger generation about physics and science in general. The Road Trip 2008 took ten undergraduate students on a nearly 600 mile round trip. The reactions and responses from the students, teachers, and administrators received by the local SPS chapter s efforts have been overwhelmingly positive, and opportunities continue to present themselves.

S11. Presenter: RJ Linton

Authors: RJ Linton, Dr. Jay Ansher

Title: Teaching Primary and Middle School Robotics

Institution: Illinois State University, email contact: rjlinto@ilstu.edu

Abstract: Many general science curriculums try to engage primary school and middle school students with the use of robot toys. While this approach has pedagogical merits the skills attained by the students are fleeting. A new approach begins with basic soldering and electronics skills culminating in competition robots built from components rather than kits. Students will be continually engaged by the prospect of the robotic competitions and retain more fundamental knowledge of the topics presented.

S12. Presenters: Amanda White, Sajjan S. Mehta

Authors: Drexel University Society of Physics Students

Title: Physics in Philly: Engaging and Enlightening Experiments for High School Students

Institution: Drexel University, email contact: sajjan.s.mehta@drexel.edu

Abstract: Aided by two consecutive Marsh White awards, the Drexel University Society of Physics Students has had a extraordinary beginning to our outreach program, both on and off campus. We report the results of these outreach efforts from the past two years. With the help of SPS advisor Dr. Roberto Ramos and physics graduate student Travis Hoppe, we have visited two local Philadelphia high schools and a summer school, performing demonstrations and experiments to engage students in science. On campus, we hosted demonstration stations for over 600 high school students at each of the past two annual Kaczmarczik Lectures and Drexel Physics Department Open Houses. We have also begun performing demonstrations on campus to promote the Society of Physics Students to our fellow Drexel students. Additionally, we are planning a student mentor program with a local high school for the upcoming school year.

S13. Presenter: Amy Marquardt

Authors: Amy Marquardt, Benjamin Franta, Jack Berkowitz, Maranda Franke, Amanda Havel, Manh Vu, Mario Affatigato, Steve Feller

Title: The Playground of Science: An annual outreach event at Coe College

Institution: Coe College, email contact: aemarqua@coe.edu

Abstract: The Playground of Science is an annual outreach event at Coe College. Students and professors from Physics, Chemistry, Biology, Nursing, Psychology and Mathematics present interactive demonstrations that teach children and their families about the natural world around them. Since its inception six years ago, the event has grown to include six academic departments and over 1,400 annual visitors, mostly enthusiastic children. Popular demonstrations include making ice cream with liquid nitrogen, launching pumpkins with a trebuchet, creating artificial snow with polymers, learning about the eyes and heart, playing with powerful magnets, and viewing distant stars through a telescope. In this poster we will present highlights from these six years as well as nuts and bolts details about how to organize such an event.

Outreach (continued)

S14. Presenter: Logan Hancock

Authors: Logan Hancock, Edward Lee (APS Advisor)

Title: Physics To Go: A Resource for Learning Outside the Classroom

Institution: Angelo State University, email contact: bhancock@angelo.edu

Abstract: The Physics To Go website (www.physicstogo.com) is one of many collections of ComPADRE, an online library of electronic resources devoted to physics and astronomy education, funded by the National Science Foundation. Physics To Go, produced by the American Physical Society (APS), is a collection focused on informal physics learning, targeted towards self-motivated learners and the general public. My contributions to the site this summer consisted of obtaining useful materials to add to the collection and working to update the homepage s mini-magazine every two weeks. I was selected for this position at APS by the Society of Physics Students (SPS) summer internship program, hosted by the American Institute of Physics (AIP) in College Park, MD. This internship is presented to a number of physics undergraduates each year and offers opportunities in research and science policy/outreach positions at SPS, APS, AAPT, NASA and NIST.

S15. Presenters: Mary Elizabeth Mills, Jenna Smith

Presenters: Mary Elizabeth Mills, Jenna Smith

Title: Makin' Waves with the 2008 SOCK

Institution: Society of Physics Students, email contact: smijk@rhodes.edu

Abstract: The Society of Physics Students (SPS) has been developing and providing SOCKs (SPS Outreach Catalyst Kits) for its student chapters for seven years, with over 200 disseminated. The theme of the 2008 kit is Makin Waves and it includes three topics: polarization, sound waves, and reflection and refraction. Each topic uses fun toys such as long springs, Boomwhackers«, and Jell-O« to engage college students and schoolchildren alike. If your chapter is interested in obtaining a SOCK, please contact the SPS National Office.

S16. Presenter: Kileigh Peturis

Authors: Kileigh Peturis, Xandria McWaters, Amanda Palchak, W. Tyler McCleery, Kyle Fortenberry

Title: Absolute Zero @ Southern Miss

Institution: University of Southern Mississippi, email contact: kileigh.peturis@usm.edu

Abstract: The University of Southern Mississippi Chapter of the Society of Physics Students has conducted an extensive outreach program to high schools throughout Mississippi and Alabama. Our outreach program was based on the Absolute Zero nation-wide outreach campaign. Our presentation included a discussion on various applications of the cold technology, several liquid nitrogen demonstrations, and illustrations of laser cooling and Bose-Einstein Condensation. By using hands-on liquid nitrogen experiments, we were able to keep the students engaged, while exposing them to the fundamentals of thermodynamics. Our outreach program not only captivated the high school students and their teachers, but also the SPS members who were assisting with the presentation. Encouraged by the positive feedback from the Absolute Zero outreach program, our SPS chapter has decided to expand on it and include other topics such as: String Theory, Relativity, Quantum Theory, Radiation Detection, Rocket Science, Medical Physics, and Astronomy. The topic to be presented at each high school will be chosen according to the material taught in the classroom at the time of visit. We expect our outreach program extension to impact more high school students and increase the chances of recruiting highly motivated students to the University of Southern Mississippi physics program.

S17. Presenter: Dr. Karen Williams

Author: Dr. Karen Williams

Title: Science Ethics Workshop-Result from 2004 Congress

Institution: East Central University, email contact: kwillims@mac.com

Abstract: The 2004 Sigma Pi Sigma Congress recommended that physics departments have professional ethics education for all physics undergraduates. The SPS statement on Engaging Students In Issues of Professional Conduct states that departments should engage students in discussions about responsible scientific behavior. This poster will highlight a science ethics workshop that I developed and that I and a colleague conducted for our physics students on campus. Many other fields (biology, chemistry) needed the workshop as it is a requirement now by NSF and NIH. We hosted the workshop at OSU and are ready to host it at other universities.

S18. Presenter: Aaron Yaeger

Author: Aaron Yaeger

Title: Outreach at Grove City College

Institution: Grove City College, email contact: yaegerae1@gcc.edu

Abstract: This poster will present our annual "Physics Day" for gifted students in a local intermediate school. Students in grades 4-6 to come and participate in an egg-drop contest, with prizes donated by local businesses. We have activities set up to help the students better understand one or more physics concepts. In 2008, we used an SPS SOCK for the first time, with great success. In addition, we have fun with liquid nitrogen, including freezing and smashing flowers and making liquid nitrogen ice cream.

General Physics

S19. Presenter: Brad Frye

Authors: Kevin M Crosby, Brad Frye

Title: Computational Fluid Dynamics Model of a Cyclone Separator in Microgravity

Institution: Carthage College, email contact: bfrye@carthage.edu

Abstract: Air cyclones are a promising technology for first stage air filtration in future lunar habitats where lunar dust mitigation is a mission critical concern. Our experimental work with cyclones in microgravity as part of NASA s Systems Engineering Educational Discovery (SEED) program suggested that gravity does not play a significant role in the operation of the air cyclone. If correct, this result paves the way for further study of cyclone filtration in microgravity. Building on the SEED research, in this project we develop a computational fluid dynamics (CFD) model of the cyclone used in the experimental work in reduced gravity to address the following questions: How does collection efficiency scale with gravity? What are the dynamical forces acting on particles in an air cyclone? Can we understand our results in terms of these dynamical forces?

S20. Presenters: Josh Fuchs, Lulu Li, Brad Arkins

Authors: Brad Atkins, Gavin Franks, Josh Fuchs, Lulu Li, Chase Sliger, Jennifer Thompson

Title: Binary Orbital Motion of Electrically Charged Spheres in Weightlessness

Institution: Rhodes College, email contact: lilu@rhodes.edu

Abstract: The similar mathematical forms of Coulombs Law of Electrostatics and Newton s Law of Gravitation predict that two oppositely charged spheres should be able to move in a binary orbit about their center of mass using only the electric force as the force of attraction. To test this prediction, we conducted an experiment in July 2008 aboard a specialized C-9B aircraft in NASA s Microgravity University Program which simulates the conditions of weightlessness. We successfully achieved multiple binary orbits between the two spheres. The orbital motion was analyzed using VideoPoint software to measure the orbital interaction of the spheres.

S21. Presenter: Eric Flumerfelt

Authors: Eric Flumerfelt, Jim Borgardt

Title: A Method for Modeling Skyshine Radiation in MCNP

Institution: Juniata College, email contact: flumeel05@juniata.edu

Abstract: Certain Radiation Portal Monitor (RPM) installations at US border crossings have been experiencing issues related to skyshine radiation. Skyshine refers to air-scattered radiation from a distant source, which is incident on the RPM s detector panels. To help design shielding configurations to mitigate this problem, a Monte Carlo N-Particle transport code model was created, which accurately reproduced the radiation s energy and angular distributions. The model was split into two stages to reduce the computational time required in running skyshine simulations. The first stage tracked radiation from the source to a region of interest which was situated 100-400 meters away. The second stage used the data from the first stage and modeled the region of interest around the portal monitors only. Because the second stage transported particles through a much smaller volume, MCNP calculations are much faster, as the long air- transport portion of the model is already complete. Also, this means that each shielding configuration is assured of being exposed to the same distribution as every other configuration. The model was built using an iterative process, with each version of the model being a more refined and more complex version of the last, until results were achieved that agreed with experimental observations.

S22. Presenters: Brian McCullough, Quincy Iheme

Authors: Brian McCullough, Quincy Iheme

Title: Homogeneous Dielectric Barrier Discharge

Institution: Saint Peter's College, email contact: bmccullough@spc.edu

Abstract: In this experiment, a homogeneous nitrogen dielectric barrier discharge (DBD) is generated with pulsed direct current (pulsed DC) power. The working gas pressure was in the range from 50 Torr to 100 Torr with a steady flow of gas into the chamber from the N2 tank, balanced with the vacuum pump to keep the pressure at the desired level. The pulsed DC was provided by a DC high voltage power supply in conjunction with a solid- state high voltage fast switch which was regulated by a frequency generator (frequency range 500 Hz to 20 kHz). The current and voltage characteristics of the plasma were measured using a high voltage probe and current monitor connected to an oscilloscope. The experiment then set out to measure the EM emissions from the plasma using a spectrometer in the ultraviolet (UV) and vacuum ultraviolet (VUV) range. Magnesium fluoride window is installed on both the DBD chamber and the spectrometer and pressed together to minimize the absorption of UV light by air.

S23. Presenter: Peter Martin---withdrawn

Title: Theoretical Determination of the Photodetachment Cross Section of the Fe Ion by the Multi-Configuration Hartree-Fock Method

S24. Presenter: Richard J. Krantz

Authors: Richard J. Krantz and Jack Douthett

Title: The Harmony of Physics, Mathematics, and Music: A discovery in mathematical music theory is found to apply in physics

Institution: Metropolitan State College of Denver, email contact: krantzr@mscd.edu

Abstract: Although it is common practice to borrow tools from mathematics to apply to physics or music, it is unusual to use tools developed in music theory to mathematically describe physical phenomena. So called "Maximally Even Set" theory fits this unusual case. In this poster, we summarize, by example, the theory of Maximally Even (ME) sets and show how this formalism leads to the distribution of black and white keys on the piano keyboard. We then show how ME sets lead to a generalization of the well-known "Cycle-of-Fifths" in music theory. Subsequently, we describe ordering in one-dimensional spin-1/2 anti-ferromagnets using ME sets showing that this description leads to a fractal "Devil's Staircase" magnetic phase diagram. Finally, we examine an extension of ME sets, Iterated Maximally Even sets that describes chord structure in music

S25. Presenter: Sean Wolf

Author: Sean Wolf

Title: An Interpolation Technique for Reduction of Sensor Density in CVT-Based Mobile Actuator Sensor Networks

Institution: University of Wisconsin-River Falls, email contact: sean.wolf@uwrf.edu

Abstract: Mobile actuator sensor networks are an emerging technology with limitless applications. Many of these such networks use Centroidal Voroni Tessellations for coverage control. However, when the sensor density is reduced these algorithms do not yield good results. This project proposes a data interpolation technique in order to solve this problem. Using this technique on a CVT-Based MAS-net simulation platform we were able to estimate the parameters of a distribution with a known form. Visibly better results as well as a cost function reduced 40 times were obtained. For even smaller densities it was shown that this technique fails. Optimal sensor placement could be used in order to combat this problem.

S26. Presenters: W. Tyler McCleery; Kileigh Peturis

Authors: W. Tyler McCleery; Kileigh Peturis

Title: What Goes Up Must Go Round: Analysis of a Falling Maple Seed

Institution: University of Southern Mississippi, email contact: wtyler.mccleery@usm.edu

Abstract: Seeds of maple trees increase their dispersion range by extending their fall time through autorotation. By rotating, the seed remains airborne for a time longer than without rotation, which increases its chances of being blown laterally by the wind and therefore increases its dissemination. It is our intent to determine which physical parameters control the autorotation and therefore maximize this dissemination. We started this project under the guidance of Professor Lawrence Mead in the summer of 2007. Our first task was to analyze what parameters control the motion of the seed. Through dimensional analysis we used these parameters to derive equations for the dependent variables: terminal velocity, rotational speed, and pitch angle. We then measured the parameters and dependent variables using various experimental techniques. Our next step is to plug these values into our derived equations and test our theory. If our equations are correct, we will be able to study more closely how each parameter affects the terminal velocity. If our equations are not correct, we will use the experimental data to fill in the gaps in the derived equations.

S27. Presenter: Alyssa Wilson

Authors: Alyssa Wilson, David Staack, Bakhtier Farouk, Tanvir Farouk, Alexander Gutsol, and Alexander Fridman

Title: Self-Rotating DC Atmospheric Pressure Discharge over a Water-Surface Electrode: Regimes of Operation

Institution: Drexel University, email contact: amw492@drexel.edu

Abstract: A DC, atmospheric pressure glow discharge produced between a metallic electrode and a water electrode is studied in this experiment. The discharge is characterized by means of visualization, high-speed imaging, voltage- current measurements, mass spectrometry and temperature measurements. Under certain conditions, the discharge exhibits a distinctive rotating motion in which the cathode spot remains stationary and the anode spot traces a circular pattern. Regimes of rotation occur in general at lower currents, at larger discharge gap lengths, and when water is the anode. Temperature measurements made in the rotating and stationary regimes are similar. Various metallic electrode materials, electrode geometries, and discharge gases are investigated to determine the conditions under which rotation occurs; it occurs only in the presence of gases containing electronegative species, with a smooth cathode and a non-oxidizing anode material, such as water or gold that is either flat or otherwise provides no hindrances to the movement of the anode spot. Finally, measurements of the frequency of rotation of the discharge with respect to discharge length and current are made. These qualitative and quantitative results are used to evaluate various types of interactions as potential sources of this behavior.

S28. Presenter: Alison E. Koser

Authors: Alison E. Koser and Paul V. Quinn Sr.

Title: The Transition of Two Dimensional Hard Spheres Under Gravity from the Liquid to Solid State Using a Global Equation of State

Institution: Kutztown University of Pennsylvania, email contact: akose905@kutztown.edu

Abstract: Using an empiracally derived global equation of state[Luding et al, Physical Review E, Volume 63 (2001)], we can accurately model the density profile of a two-dimensional system of hard spheres with diameter d and mass m under gravity given some temperature T. We then compare our theoretical graphs to simulated MD data. In a given system, if the temperature obtained from the density profile is below some critical value Tc, then crystallization occurs and we can solve for the number of frozen layers. Again, we compare out theoretical values for number of frozen layers with the number of frozen layers seen in the simulated data. In addition, we use the global equation to solve for the center of mass and its fluctuations as a function of T.

S29. Presenter: Carl E. Faust

Authors: Carl E. Faust and Paul V. Quinn Sr.

Title: The Examination of the Angle of Repose in a Vertically Vibrated Granular System

Institution: Kutztown University of Pennsylvania, email contact: cfaus139@kutztown.edu

Abstract: Experiments are conducted using various granular materials subject to a vertical vibration. The angle of repose is studied while varying certain parameters of the system, such as vibration amplitude, vibration frequency, initial height, grain size, container size, and container shape. Empirical relationships are found for the angle of repose as a function of each of these variables. Precession of the angle of repose is also examined, particularly as a function of grain size.

General Physics (continued)

S30. Presenter: Daniel Bullock

Authors: Daniel Bullock, David Bixler

Title: A Classical Model for Virtual Particle Exchange

Institution: Angelo State University, email contact: dbullock@angelo.edu

Abstract: Bubbles that form in puddles from raindrops show a relationship between size and lifetime that may be characteristic of uncertainties in particle creation and annihilation. The energy borrowed from the puddle to create the bubble must be repaid within an uncertainty in lifetime, similar to the way a virtual particle must return its energy without being detected. The interaction between bubbles also demonstrates the limited range of the strong and weak forces. Furthermore, additional particle characteristics are observed such as coupling, combining, and splitting. This project seeks to evaluate this experiment as a teaching model for virtual particles by calculating the uncertainty relationship and altering the interacting medium to better correlate the data with known uncertainties of specific particle exchanges.

S31. Presenter: Michael B. Wilson

Authors: Michael B. Wilson; Dr. Jim Cottingham, advisor

Title: Determining the Young's Modulus of Organ Reeds

Institution: Juniata College, Coe College, email contact: wilsomb05@juniata.edu

Abstract: An experiment was conducted to determine the Young s modulus of brass reeds from American reed organs. Three methods were used. The beam deflection method involved measuring displacement for attached masses. A resonant frequency method was used to calculate the Young s modulus from the resonant frequencies of transverse and torsional modes of vibration. The third method was a wave coefficient method by Liao and Wells, where a wave-number is found that forces data at all measurement points to conform to the general forced-vibration solution for a beam, implying they have the same wave coefficients [Journal of Sound and Vibration, Volume 295, Issues 1-2, 8 August 2006, Pages 165-193]. Each of the three methods assumes the reed to be a uniform bar. Three reeds of the same frequency were selected, with cross sections of varying uniformity. For the approximately uniform Estey reed, each of the three methods of measurement gave similar results. The remaining reeds, which have varying thicknesses, had significant discrepancies between the traditional methods and the wave coefficient method. The wave coefficient method, which does not require the measurements along entire length of the beam, was applied to only the most uniform section of the reeds, giving more accurate results.

S32. Presenters: Ron Draper, Andrew Adams, David Levine, Andrea Roma

Authors: Ron Draper, Andrew Adams, David Levine, Andrea Roma

Title: Green River's Cosmic Ray Detector- A collaboration with WALTA

Institution: Green River Community College, email contact: anroma1026@aol.com

Abstract: When Fermilab s CASA project was complete many of the muon detectors were still operable, so a new project was started, NALTA. These left over scintillators were spread across the country in order to increase the area of observation of muon showers, shining a brighter light on ultra-high energy cosmic rays and giving students hands on experience with science equipment as well as active research. A large area is needed to detect the highest energy cosmic rays. In order to organize the wide spread grid, subdivisions of NALTA were formed. WALTA is the University of Washington s entry, and collects data for the greater Seattle area. Green River Community College is among a number of Community Colleges and high schools that maintain and operate some of the cosmic ray detectors. This is a combination of our exploration into the evolving history of cosmic ray research, as well as an explanation of the assembly and operation of the station equipment. In addition, we will discuss some of the changes in the WALTA system as new equipment is provided by Fermilab to replace the old counters and data collection system.

S33. Presenter and author: Claire Thomas

Title: Double Chooz at Nevis Labs: 2008 Summer REU

Institution: Columbia University, REU 2008, email contact: claire@bu.edu

Abstract: I will present my work for the Double Chooz experiment at Columbia University's Nevis Labs during the 2008 Summer REU program. Double Chooz is a neutrino experiment that will either measure or constrain the neutrino mass mixing parameter, theta(13). I will motivate the study by describing neutrino oscillation and its implications on the Standard Model. I will also present the details of the work I did this summer. Columbia University and collaborators are responsible for the Double Chooz Outer Veto, which detects incoming Cosmic Muons to prevent false signal in the main detector. After some preliminary testing, our group at Nevis constructed a small prototype of the Outer Veto. We expected to see about 3000 Muon events in two hours in our prototype and these Muons typically deposit about 10 photoelectrons into a detector. When we first performed the test, we detected a typical value of 1 photoelectron and a rate of only ~100 Muon events in two hours. After improvements we measured 1000 Muon events, depositing 8 photoelectrons. I will describe the steps we took to improve the experiment, and possible reasons for the continued deficit of detected Muons.

S34. Presenter: Christopher Thomas

Authors: Christopher Thomas, Timothy Darling, Aaron Covington

Title: Gamma and Fast Neutron Detection from Deuterium-Loaded Pd Wires in a 1MA Z-Pinch

Institution: Nevada Terwatt Facility, Department of Physics, University of Nevada, Reno, email contact: calculus_85_04@yahoo.com

Abstract: Experiments conducted through the Nevada Terawatt Facility (NTF) at the University of Nevada, Reno focus on the study of magnetically-confined plasma columns produced in a Z-pinch (Zebra) apparatus. Zebra uses a Marx capacitor bank of 32 capacitors to discharge 2MV and 1 MA into a target chamber where thin (~10-20μm in diameter) metal wires are turned into plasma. The detection of gamma radiation and nuclear particles from these high-energy-density experiments is not well developed, but a detection system capable of high energy and intensity resolution can give insight to instabilities and processes inside the plasma, which are poorly understood. Calibration of gamma and fast (K=2.45 MeV) neutron detectors is being done at the NTF. These detectors will be used to measure fluxes of gamma radiation and nuclear particles from a unique target, palladium metal with internally stored hydrogen and deuterium. Here are some calibration techniques that were used, along with preliminary results.

S35. Presenter: David Jacome

Authors: David Jacome, Lydia Sierra, Maria Alvarez, and Jose Lopez

Title: Understanding the Operational Characteristics of the Capillary Plasma Electrode(CPE)

Institution: Saint Peter's College, email contact: djacome@spc.edu

Abstract: A capillary plasma electrode (CPE) is a device that produces stable atmospheric pressure non- equilibrium plasmas. The CPE is similar to the dielectric-barrier discharge. Their defining common feature is the presence of dielectric layers allowing charges generated in the gas to reach the conducting electrode surfaces without arcing. The difference between these two sources is that a CPE has a discharge operational mode where a plasma jet is formed. The plasma jet formation depends on the frequency and electrical power. This CPE plasma has a wide range of application such as the destruction of pollutants, the generation of ozone, the pretreatment of air for modifying or improving combustion, the destruction of various organic compounds, and surface cleaning of various objects. For these reasons, it s important to understand the CPE---mostly its unique jet plasma formation. For this reason we focused on studying the behavior of the CPE under plasma jet mode. Using optical emission spectrometer was a crucial step to understanding the plasma emission characteristics and formation of the CPE. The frequency, flow rate and the electrical power were measured which are 3 important guidelines to consider. As you increase the power the plasma starts to lose stability. This occurs at a frequency range of 20 to 105 kHz, going beyond 105 kHz, the CPE will not work. At higher frequencies, the plasma tends to need more power to turn on, you observe it getting brighter. At

S36. Presenter: Jodie Barker-Tvedtnes

Authors: Jodie Barker-Tvedtnes, Michael Taylor, Matthew DeLand

Title: Noctilucent Clouds from Above and Below

Institution: Utah State University, email contact: jbt113@gmail.com

Abstract: Noctilucent or night shining Clouds (NLCs) are tenuous ice clouds that form near the extremely cold (<150K) summer mesopause region (80-85 km). From the ground, these clouds are seen during twilight hours from latitudes typically ranging from 50? to 65?. When observed by satellites, these clouds are referred to as Polar Mesospheric Clouds (PMCs). Over the last several decades, observations by the Solar Backscatter Ultraviolet (SBUV) instruments on the NOAA satellites have shown that the occurrence and brightness of NLCs have been increasing prompting speculation concerning their possible role in climate change. Recently the Aeronomy of Ice in the Mesosphere (AIM) satellite was launched (April 2007) and is the first satellite dedicated to the study of NLCs. In this presentation, we compare SBUV and AIM PMC observations with ground-based image data collected during campaigns from Edmonton, Canada (June 30-July 17, 2007) and Delta Junction, Alaska (July 29-August 17, 2007). Four nights of data are presented where coincident measurements were obtained by AIM, SBUV and ground-based imagers. The results show good spatial or temporal agreement, but rarely both, and illustrate the importance of coordinated measurements for better understanding the geographic and local time variability of NLCs.

S37. Presenter: Cody Crewson

Author: Cody Crewson

Title: Using Boron to Track Possible Contamination from Oil-Sand Extraction

Institution: University of Calgary, email contact: cody.crewson@gmail.com

Abstract: Northern Alberta Oil-sand recovery processes are important to Canadian Oil production and the Alberta Economy. some extraction methods may impact ground water aquifers and are of environmental concern. Cyclic Steam Stimulation is a high temperature, high pressure process that could compromise the containment of an oil reservoir or push excess contaminated water into local groundwater supplies. Thus there is a need to trace the potential source(s) of a contaminant. One potential method is the analysis of the stable Boron isotope composition of regional waters. The Boron isotopic composition of water from different sources is often distinct and this signature is retained as said water mixes with ground water. Williams et al. (2001) showed that the composition and concentration of Boron present in water used for Steam Injection is different from that of the region and that of water trapped in bedrock. Using Thermal Ionization Mass Spectrometry it is possible to measure the isotope ratio of Boron. Furthermore it is possible to accurately determine the concentration using the Isotope Dilution technique (Heumann , 1992). The analysis of Boron concentrations and isotope composition may be a critical analytical tool to indicate the flow of potentially contaminated waters and assess the extent of the contamination.

S38. Presenter: Isa Fritz

Authors: Isa Fritz & Dr. Brian Schwartz

Title: Construction and Characterization of an Optical Tweezer System

Institution: Carthage College, email contact: ifritz@carthage.edu

Abstract: The goal of this research project is to construct an optical tweezer system. An optical tweezer uses high intensity laser light to manipulate tiny particles. Our design incorporates a 250mW laser and an inexpensive imaging system. In addition, we can control various aspects of target particles such as position and orientation. Here we show basic elements of the tweezer theory, the setup and imaging examples.

Astrophysics (see also Astrophysics poster F6 on Friday)

S39. Presenters: Sajjan S. Mehta, Amanda White

Authors: Drexel University Society of Physics Students

Title: Variable Star Observation and Search

Institution: Drexel University, email contact: sajjan.s.mehta@drexel.edu

Abstract: Variable stars are stars that vary in their light output over time. We have used the on-campus observatory facility, as well as supplies purchased with a Sigma Pi Sigma undergraduate research grant, to locate, observe, and collect data on these stars. The main objective of the project was to learn to accurately perform CCD photometry while engaging members of SPS with a long-term research project. Our goal was to match our gathered data to confirmed data recorded by the American Association of Variable Star Observers and to begin to contribute results to the organization. Our analysis of the data has since helped us to determine the best observing and calibration techniques for photometry in the heavily light-polluted skies of Philadelphia.

S40. Presenter: Louise Riofrio---withdrawn

Institution: NASA Contractor, email contact: Sailorstarfightr@yahoo.com

S41. Presenter: Jones, Therese

Authors: Jones, Therese; Charlton, Jane

Title: Using Absorption Lines to Probe the Universe

Institution: Penn State, email contact: tmj143@psu.edu

Abstract: Quasar and Gamma-Ray Burst absorption lines may be used to probe the universe, from redshifts greater than 6 to nearby clouds in the Milky Way. We detail the methods by which one can study the intrinsic properties of quasars, the evolution of the intergalactic medium, galactic structure and morphology, and high velocity clouds.

S42. Presenter: Douglas Parsons

Authors: Douglas Parsons, Mark Sonntag

Title: Astronomical Photometry and its applications

Institution: Angelo State University, email contact: dparsons1@angelo.edu

Abstract: Astronomy employs a vast array of methods for observing the known universe and pushing back the boundary of what is known. Without the ability to travel to distant stars to run experiments on them, the light they emit must be used in some fashion. Photometry is one such method for expanding our knowledge of the universe. By measuring the period of oscillation in the intensity of stars known as Cepheid Variables, the distances to other galaxies and star systems can be derived. Thus the boundaries of the universe can be mapped out. While stars themselves are fascinating, even more intriguing are the possibilities of finding planets around distant stars. Photometry allows for the detection of these planets under certain conditions, as well as measuring physical properties of these extra-solar planets. In keeping with this knowledge, I will be measuring the periods for two variable stars Eta Aql and SU Cyg - and comparing the data with the known periods to further refine the measurement. I have also targeted HD209458 which contains a known planet in orbit and, with the use of photometry, will measure the orbital period of the planet.

S43. Presenter: J. R. Knight

Authors: J. R. Knight and Shane L. Larson

Title: LISA Observations of Accreting Binary Star Systems

Institution: Utah State University, email contact: jake.knight@aggiemail contact.usu.edu

Abstract: Recent technology is allowing us to look at the Cosmos in more ways than ever before. The LISA (Laser Interferometer Space Antenna) observatory is a NASA/ESA project that will look at the Universe not with light, but with gravitational waves. This poster describes a research project to take classic electromagnetic observations of the light curve from close binary star systems, and use them in concert with gravitational wave observations by LISA to give us new insight into the astrophysical character of these systems. This research poster considers close white dwarf binaries, where the stars are close enough for mass transfer between the components of the system. The specific aim is to consider how the comparison of the electromagnetic and gravitational wave signals can be used to determine the size of the accretion disk formed by the mass transfer. The work will entail simulation of the mass transfer between the stars, as well as the expected gravitational wave signal that LISA will see. This simulation will allow the geometrical and physical parameters of the system to be correlated with the time dependent signature of the gravitational wave and electromagnetic signals.

S44. Presenter: Ian J. Gilbert

Authors: Ian J. Gilbert, Henry A. Kobulnicky, Daniel C. Kiminki

Title: The Discovery of Several Probably Runaway Stars in the Cygnus X Region

Institution: Grove City College, email contact: GilbertIJ1@gcc.edu

Abstract: We report the discovery of three candidate runaway stars in the Cygnus X region identified by bowshocks found in Spitzer Space Telescope mid- IR images. Followup optical spectroscopy from the Wyoming Infrared Observatory 2.3 m telescope and the WIYN 3.5 m telescope were obtained during 2008 June and July to determine spectral types and radial velocities of these stars. All three runaway candidates, GSC03161-01188, G80.90209+0.98298, and HD 195229, are massive early type stars, typical of the known runaway stars in the Galaxy. The present data are insufficient to allow us to pinpoint the origins of these runaways. Only G80.90209+0.98298 has a bowshock morphology that could be consistent with an origin within Cygnus OB2. Taken together, these results indicate modest radial velocities but potentially large tangential velocities. The number of new runaway stars in this region is consistent with Cygnus X being a birthplace for new high-velocity stars. We also provide the first radial velocity measurement, -66 km/s, for BD+43 3654, a known runaway star with a mid- infrared bowshock.

Astrophysics (see also Astrophysics poster F6 on Friday)

S45. Presenter: Robert Barchfeld

Authors: Robert Barchfeld, Vera Margoniner, David Wittman

Title: Photometric Redshifts and Artificial Neural Networks

Institution: California State University, Sacramento, email contact: regent@table2.com

Abstract: In recent years, photometric redshifts have offered an alternative to spectroscopic redshifts for determining distances to galaxies. Spectroscopic methods are the tools of choice whenever possible, however, they are far too resource intensive to be practical in large surveys. Problems are compounded when very dim objects are of interest. Broadband photometry can be collected far more quickly and inexpensively than is possible with spectroscopy. This research focused on the use of artificial neural networks for acquiring redshifts. Photometry and known spectroscopic redshifts were used to train artificial neural networks, and then these trained networks were applied to large catalogs of galaxies with similar photometry. The performance of this method was evaluated by comparing the network output with known spectroscopic redshifts. This project searched for optimum training methods to obtain reliable results. Training data must be well representative of the catalog being analyzed. Important aspects considered were the number of object trained with, their distribution of redshifts and magnitudes, types of objects, photometric noise, and color degeneracies. Data analyzed in this project were simulated data modeled after Deep Lens Survey, and real data from Sloan Digital Sky Survey.

S46. Presenter: Jennifer Hendryx

Authors: Jennifer Hendryx, Yevgeny Raitses, Valery Godyak, and Nathaniel J. Fisch

Title: Parametric Characterization of RF Plasma Cathode with Gas Flow

Institution: Angelo State University, Princeton Plasma Physics Laboratory, email contact: jhendryx@angelo.edu

Abstract: A plasma cathode that utilizes electron extraction from a radio frequency (rf) plasma could potentially have a longer lifetime than conventional thermionic and field emissive cathodes. If integrated with ion thrusters, this rf-plasma cathode could significantly lengthen the duration of space missions that utilize thruster propulsion. We study the electron extraction for a novel low-frequency rf-cathode in the presence of gas flow. The extracting electrode (anode) is movable and biased with respect to the conducting wall of the rf- cathode. The variable parameters of interest in the rf-cathode operation include extraction voltage, distance between anode and rf-plasma source, and gas flow. The results of varying these parameters will be presented. Previously this plasma was studied under static pressure conditions. The gas flow in this experiment is expected to increase the current because more neutral atoms are available for ionization, meaning that more electrons could be produced for a longer amount of time. The ultimate goal is to optimize electron source lifetime. This work was supported by the US DOE under contract No. DE-AC02-76CH03073

S47. Presenter: Jani, K.P.

Authors: Jani, K.P; Finn, L.S.; Kopparapu, R.K.

Title: Mapping the Sensitivity of LISA

Institution: Penn State, email contact: tmj143@psu.edu

Abstract: The Laser Interferometer Space Antenna (LISA) is a proposed NASA/ESA space-based gravitational-wave detector and is sensitive to gravitational-waves in the frequency range of 10^(-4) - 1 Hz. It consists of 3 spacecrafts arranged in an equilateral-triangle configuration to act as interferometer. The centroid of this triangle trails 20 degrees behind the Earth's orbit and the plane of LISA makes an angle of 60 degrees with respect to the orbital plane of the Earth. Thus, the one year rotation around the Sun will make LISA sensitive to specific portions of the sky. In this study, we attempt to map an antenna pattern for LISA in the Galactic and the Ecliptic co-ordinate systems, to find out which portions of the sky are sensitive to LISA at a particular instance of time.

S48. Presenter: Feng, Lu

Authors: Feng, Lu; Fox, Derek B.

Title: Could the GRB-Supernovae 031203 and 060218 be Cosmic Twins?

Institution: Penn State, email contact: tmj143@psu.edu

Abstract: The gamma-ray burst / X-ray flash events 031203, discovered by INTEGRAL, and 060218, discovered by Swift, represent two of only five GRB-supernovae with optical spectroscopic confirmation of their supernova components. Yet their observed high-energy properties offer a sharp contrast: While GRB 031203 was detected as a short 40-s burst with a spectrum peaking at >190 keV, XRF 060218 was a >2000-s long, smoothly evolving burst with a peak energy of 4.9 keV. At the same time, the observation of an evolving dust-scattered X-ray halo following GRB 031203 has been used to argue that this event was actually an X-ray flash. Taking this observation as our starting point, we investigate the intriguing question of whether the 031203 and 060218 events might in fact have been cosmic twins with nearly-identical high-energy properties.

S49. Presenter: Cameron Van Eck

Authors: Cameron Van Eck and Jo-Anne Brown

Title: Magnetic Fields in Space: Measuring the magnetic field of our Galaxy

Institution: University of Calgary, email contact: clvaneck@ucalgary.ca

Abstract: Just at the Earth and Sun have their own magnetic fields, so too does our Galaxy. Interstellar magnetic fields play critical roles in many astrophysical processes, yet our knowledge about Galactic magnetic fields remains limited. Since in situ measurements of these fields are not yet practical, we must rely on more difficult indirect methods. Most of what we do know comes from radio astronomy, through observations of polarization and Faraday rotation measures (RMs) of extragalactic sources and pulsars. Currently, work is being done to measure the structure of magnetic fields on large scales. Understanding the overall structure of the magnetic field will subsequently help us determine the origin and evolution of the field. We will discuss the methods used to measure magnetic fields in interstellar space, and will present our current work: using data from the Very Large Array radio observatory to calculate RMs for areas of the Galaxy for which there is insufficient data for testing models of the field structure.