2008 Sigma Pi Sigma Congress Research Abstracts

Friday, November 7, 2008

ARBITRARY GROUPINGS					
Physics Pedagogy Research	**Astrophysics** (see more Astrophysics posters Saturday)	**Particle Physics**	**Optical Physics**	**Condensed Matter Physics**	**Biophysics**
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Physics Pedagogy Research

F1. PRESENTER: ERICA P. WATKINS, CHICAGO STATE UNIVERSITY, *ericapwatkins87@yahoo.com*
Authors: Erica P. Watkins and Mel S. Sabella; Chicago State University
Title: **Examining the Effectiveness of Clickers on Student Learning by Tracking Student Responses**

Abstract: Clickers have been used for a number of years to help create active learning environments in the lecture classroom. Researchers have shown that clickers stimulate student-student and student-lecturer interaction. In addition, students value the use of clickers and feel that these devices contribute to their understanding. Unfortunately, there are few research studies focusing on how knowledge is enhanced through their use. To contribute to this body of research, we compared student responses on exam questions to similar or identical clicker questions presented during lecture. Analysis of the responses to clicker and exam questions show how individual student knowledge evolves during instruction. Although there is evidence of improvement during lecture, our results indicate that many students struggled when the questions were posed on exams. In this poster, we present the findings from this study and discuss how open-ended questions and interviews allow us to better understand how clickers are affecting our instructional environment.
* Supported by NSF Grant #DUE-0618128 ** Based on work presented at the 2008 Physics Education Research Conference

F2. PRESENTER: SEAN GALLARDO, CHICAGO STATE UNIVERSITY, *sean1g1@yahoo.com*
Authors: Sean Gallardo, Kim Coble, Mel Sabella; Chicago State University
Poster Title: **Applying Successful Techniques to Transform Physics and Astronomy in Urban Classrooms**

Abstract: The physics program at Chicago State University (CSU) has adopted an instructional environment that embraces inquiry-based instruction research on student learning, and instructional revision. Based upon successes in our introductory physics courses, we have expanded our program to include the introductory astronomy and modern physics courses at CSU and the introductory physics sequence at Olive Harvey College, a nearby urban community college. In this poster we describe our implementation, preliminary research on the effectiveness of our materials, and the successes and challenges we face as our project expands to different instructional environments.
*Supported in part by NSF grant #DUE 0632563 **Based on work presented at the 2008 Physics Education Research Conference

F3. PRESENTER: REBECCA CREMA, GROVE CITY COLLEGE, *cremarl1@gcc.edu*
Authors: Rebecca Crema and Dr. D. J. Wagner; Grove City College
Poster Title: **Understanding Electric Circuits**

Abstract: I am researching students understanding of electric circuits in an introductory, non-science-major physics class at Grove City College. Differentiating between and understanding current, voltage, and resistance is usually quite difficult and confusing for many students. I have been researching the common misconceptions held by students before, during, and after their class and lab involvement with circuits. Students in the class I studied spend two lab sessions working with circuits. Each lab may include both a pre-lab reading and a follow-up homework assignment. The students complete the first lab before hearing about the subject matter in lecture. I videotaped students using the original laboratory materials, interviewed students about their understanding of circuit concepts after each lab activity, and analyzed diagnostic test data to identify specific problem areas. I, along with Dr.D. J. Wagner, have re-written and edited the pre-labs, lab activities, and homework assignments to help improve student knowledge acquisition. This poster will present the difficulties students were encountering, describe how we modified the lab materials to better address those difficulties, and summarize the changes in diagnostic data we saw after introducing the modified materials.

Physics Pedagogy Research (continued)

F4. Presenter: Geraldine L. Cochran, Chicago State University, *moniegeraldine@gmail.com*
Authors: Geraldine L. Cochran and Mel S. Sabella; Chicago State University
Poster Title: **Understanding and Encouraging Effective Collaboration in Introductory Physics Courses [1]**

Abstract: Anecdotal evidence from introductory physics classrooms at Chicago State University suggests that our students view collaboration as an important tool in their learning. Despite this, students often need additional instruction and support for effective collaboration to take place. In order to aid students in establishing effective collaborations we want to capitalize on students' appreciation of the inquiry approach to instruction. In this poster, we present the initial stage of this work. Specifically, we have begun to videotape student interactions in the classroom and interview students about the nature of learning. In addition, we have developed and administered an instrument that gauges the value students place on the use of guided inquiry. By utilizing a specific criteria and analyzing the occurrence of specific behaviors in the classroom we can determine the effectiveness of collaboration during group work.[2] Responses regarding how students value the use of questions in instruction suggest how peer questioning can be used to promote effective collaboration. Presented at the 2008 Physics Education Research Conference.
[1] Supported by the NYC Alliance Bridge to Teaching and NSF grant #DUE 0632563.
[2] Vellom, R.P., & Anderson, C.W. (1999). Reasoning about data in middle school science. J. of Research in Sci. Teaching, 36(2), 179.

F5. Presenter: Sam Cohen, Grove City College, *Cohensj1@gcc.edu*
Authors: Sam Cohen, Dr. DJ Wagner, Ashley Cetnar; Grove City College
Poster Title**: Developing Diagnostic Questions About Fluids**

Abstract: This poster will present our progress in developing a series of research-based diagnostic questions on fluids, suitable for a range of introductory courses. Many standardized diagnostic exams have been introduced to the physics education community, but we know of no such resource covering fluids topics like pressure and Archimedes principle. For the past three years, we have been asking students in three different introductory courses at Grove City College a mix of multiple choice and free-response questions on selected topics. We will present findings from the data from previous year sand describe how we used that data, and others published results, to prepare the next generation of the diagnostic questions. These revised questions were introduced this fall, and we will report some of our preliminary impressions based on pre-test responses and informal interviews with students.

Astrophysics (see other astrophysics posters on Saturday)

F6. Presenter: Erin O. Martin, California Institute of Technology
Authors: Dr. Donald Hoard, Erin O. Martin; California Institute of Technology, *erinomartin@gmail.com*
Poster Title: **Determining and Cataloging the Proper Motions of White Dwarf Stars**

Abstract: This study catalogs the proper motions of almost three hundred white dwarf stars. White dwarfs (WDs) are intrinsically dimmer than main sequence stars. Since WDs are intrinsically faint, only those that are relatively nearby are visible. Because of their close proximity, they display large proper motions. Using the First Palomar Observatory Sky Survey (POSS1) from the 1950s, the Second Palomar Observatory Sky Survey (POSS2) from the 1980s, and the 2-Micron All Sky Survey (2MASS) from the 1990s and 2000s, WDs are located for each year and their current positions updated. These WDs are cataloged and the proper motions for each are found. The catalog is available at: http://web.ipac.caltech.edu/staff/hoard/wdwebfinder/index.html. It is used to help Astrophysicists locate the WD during an observing run.

Particle Physics

F7. Presenter: Dillon Thomas, Abilene Christian University, *djt05d@acu.edu*
Poster Title: **Quality Control for the RPC Upgrade for PHENIX**

Abstract: The PHENIX detector is located at Brookhaven National Laboratory on the Relativistic Heavy Ion Collider (RHIC) ring where it studies both heavy ion and polarized proton-proton collisions. One of the primary goals of the polarized proton program is to improve our understanding of the proton's spin structure. A level 1 trigger upgrade is currently being constructed for PHENIX. This will involve the installation of Resistive Plate Chambers (RPCs). These new chambers will improve our ability to trigger on high transverse momentum single muons that are produced in the decay of W bosons. After these chambers are constructed, they must be carefully and completely checked to ensure they operate properly, before they are installed in the PHENIX spectrometer. These chambers are assembled as modules and then tested in our cosmic ray test stand while they are hooked up to data acquisition and gas systems. From cosmic ray muons, we can carry out tests to learn the efficiency and performance of each RPC. These tests ensure that only fully efficient chambers will be used in the final installation in the PHENIX spectrometer. Data and graphs of the efficiencies and performance will be presented.

F8. Presenters: S. Boona, N. Scurti, Northern Illinois University, *stephenboona@gmail.com*
Authors: S. Boona, N. Scurti, G. Lima, V. Zutshi, D. Hedin (NIU/NICADD) for CALICE Collaboration; Northern Illinois University
Poster Title: **Analysis of Test Beam Data from Prototype Calorimeters for Future Particle Physics Detectors**

Abstract: Using muon and pion test beam data collected at Fermilab and CERN, data analysis software was developed to study the properties of a prototype calorimeter being developed by the Calorimeters for the ILC Experiment (CALICE) Collaboration. Part of this prototype is known as the Tail Catcher Muon Tracker (TCMT) which is operated by the Northern Illinois Center for Accelerator and Detector Development (NICADD). Three distinct research goals are discussed: calibration of each of the 320 unique Silicon Photo Multiplier cells of the TCMT using minimum ionizing particles; measurement of the optical signal attenuation within the wavelength shifting fibers running the length of each scintillation strip; and development of a method for comparing crosstalk effects within the TCMT to simulated crosstalk in Monte Carlo events.

Particle Physics (continued)

F9. Presenter: Timothy Jones, Abilene Christian University, *tgj05e@acu.edu*
Poster Title: **PHENIX RPC Production Database**

Abstract: The Pioneering High Energy Nuclear Interaction eXperiment (PHENIX) is located on the Relativistic Heavy Ion Collider (RHIC) ring at Brookhaven National Laboratory. A primary physics goal that can be studied by PHENIX is the origin of the proton spin. One of the types of rare events looked for in the moun arms at PHENIX are single high transverse momentum muons, which tend to result from the decay of a W boson. Resistive Plate Chambers (RPCs) will be used as a level 1 trigger to select these events from a large background of low transverse momentum muons. As these RPCs are assembled it is necessary to keep track of the individual parts of each RPC as well as data from various quality assurance tests in a way that will allow the information to be easily accessible years to come as the RPCs are being used. This is done through the use of a database and web page interface that can be used to enter data about the RPCs or to look up information from tests. I will be presenting on how we keep track of the RPCs, their parts, and data from quality assurance tests as they are being assembled as well as how we can retrieve this data after it has been stored in the database.

F10. Presenter: Tyler Hague, Abilene Christian University, *TJHague@gmail.com*
Poster Title: **Slow Controls Using the Axiom M5235BCC**

Abstract: PHENIX plans to use the Axiom M5235 Business Card Controller for slow controls. This controller features theFreescaleMCF5235 microprocessor. It also has three parallel buses, these being the MCU port, BUS port, and enhanced Time Processing Unit (eTPU) port. The BUS port uses a chip select module with three external chip selects to communicate with peripherals. This will be used to communicate with and configure Field Programmable Gate Arrays (FPGAs). The controller also has an Ethernet port which can use several different protocols such as TCP and UDP. This will be used to transfer files with computers on a network. The M5235Business Card Controller will be placed in a VME crate along with VME card and a Spartan-3 FPGA.

F11. Presenter: Philip Bailey, Abilene Christian University, *philmb@gmail.com*
Poster Title: **High Voltage System for RPC QA in a Cosmic Test Stand**

Abstract: PHENIX is an experiment at RHIC designed to probe the spin structure of the proton by observing high energy polarized proton-proton scattering. Observing W boson production is an effective way to measure this polarization. The W bosons are identified by detecting their characteristic decay particles muons. In order for these rare events to be effectively measured, however, the muon trigger requires an upgrade that will allow the higher rejection rate required by higher luminosities at RHIC. The upgrade will allow PHENIX to trigger only on the high pT muons and ignore the lower pT background muons. The actual hardware that will provide the triggering is called an RPC. In order to test the working condition of the RPCs, they will be placed on a test stand in order to gain assurance that cosmic muons are seen by the detectors. The high voltage systems, including cabling and data logging software, that operate the RPCs in the cosmic test stand will be presented.

F12. Presenter: Scott Stewart, Abilene Christian University, *sls06d@acu.edu*
Poster Title: **The NIFFTE Fission TPC**

Abstract: The Neutron Induced Fission Fragment Tracking Experiment (NIFFTE) will make fission cross section measurements for next generation nuclear reactors using a Time Projection Chamber (TPC). Collaborating institutions are Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Idaho National Laboratory, Georgia Institute of Technology, Abilene Christian University, Oregon State University, Cal Poly San Luis Obispo, Colorado School of Mines, and Ohio University. It is funded under the Global Nuclear Energy Partnership (GNEP) in order to increase the precision needed for the design of a new generation of fast neutron reactors. The TPC is a new tool to improve the existing measurements that used fission chambers. The TPC will allow an overall view of the fission event and will distinguish it from background processes; primarily alpha decay. The experiments are planned at the Los Alamos Neutron Scattering Center (LANSCE) utilizing neutron beams from 10 keV to 10 MeV where existing fission cross sections have typical uncertainties of 5%.

F13. Presenter: Remington Thornton, Abilene Christian University, *rtt06a@acu.edu*
Poster Title: **GEANT4 Simulation of TPC**

Abstract: The Neutron Induced Fission Fragment Tracking Experiment(NIFFTE) collaboration s Time Projection Chamber (TPC) is designed to measure better fission cross-section measurements that can be used in designs for future generations of more advance nuclear power plants. One important requirement of the TPC project is to have an accurate simulation of the physical volume and realistic data flow. GEANT4 is a multi-purpose3-D Monte Carlo simulation package that has been chosen for this effort. The sensitive volume of the TPC has been created in GEANT4 along with simulations of the detector response, which includes: 3-D ion diffusion, pedestal fluctuations, charge sharing and digital latching noise. In this talk, results from the initial simulation will be described in detail.

Optical Physics

F14. Presenter: Isa Fritz, Carthage College, *ifritz@carthage.edu*
Authors: Isa Fritz & Dr. Brian Schwartz; Carthage College
Poster Title: **Construction and Characterization of an Optical Tweezer System**

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.

Optical Physics (continued)

F15. Presenter: Devin Underwood, University of Wisconsin River Falls, *devin.underwood@uwrf.edu*
Authors: Devin Underwood; University of Wisconsin River Falls
Poster Title: **Plasmonic Nano-Lithography using Absorbance Modulation**

Abstract: In optical lithography the fabrication of nano and micro-electronic devices usually requires a permanent mask. Constructing this mask is usually a time consuming, and often expensive process. This project investigated the idea of using a Surface Plasmon Standing (SPP) wave to expose an underlying layer of photoresist; without the use of a permanent mask. This exposure was done means of an Absorbance Modulation Layer (AML); which acted as a temporary, periodic mask and thus allowed the interface of photoresist and a conducting metal to be illuminated. From this illumination we looked to excite a Surface Plasmon Polariton standing wave. This standing would then be recorded into the photoresist, and would form multiple subwavelength line patterns. Verification of the existence of SP s was shown using a Finite Difference Time Domain software called MEEP. Further data was collected in the form of AFM images so as to experimentally verify the existence of SPPs.

F16. Presenter: Jason Okerman, West Virginia University, *online1@okermans.com*
Authors: J. Okerman, J. D. Dawson, L. A. Hornak; West Virginia University
Poster Title: **Optical Modeling and Characterization of Suspended Si Waveguides**

*Abstract: Current biosensor systems invoking fluorescent emission often require large, high power equipment that is not suitable outside of the lab. Use of a novel photonic crystal-based design with a light-confining resonant cavity can enhance detection capabilities by more than 20 times. This research is motivated by a proposed design for an advanced opto-fluidic biosensor which is both highly-sensitive and very portable. In order for fluorescence to occur, the pump light needs to be guided to focus on the sample being analyzed. Toward this end, we investigated the theoretical propagations of IR light in silicon waveguides. We also developed methods to fabricate thin (2 **μm** and 200 nm) air-clad waveguides which were fully suspended over a silicon base. This process produced usable waveguide structures with sharp edge profiles. To verify the effectiveness and characteristics of the Si waveguides, we developed an opto-mechanical test bench which attempted to efficiently focus light into the waveguides. We favored an end fire coupling technique because it did not put damaging pressure on the suspended Si structures, but found that this method was far from ideal due to spot-size, alignment limitations, and losses from surface reflection and edge irregularities.*

F17. Presenter: Brad Dinardo, Juniata College, *Dinarba07@juniata.edu*
Authors: Brad Dinardo, Daniel J. D Orazio, Kenny Goodfellow, Amy Frantz, and James D. White; Juniata College
Poster Title: **Using Beat Frequency Line Shape To Analyze Laser Bandwidth**

Abstract: Using saturated absorption spectroscopy, two diode lasers are locked to the peaks of adjacent hyperfine spectral lines in the Rubidium absorption spectrum and made collinear to produce a beat frequency signal at~30 MHz. This beat signal will aid in the search for a superior method for locking and stabilizing diode lasers. Summer internships supported by NSF RUI PHY-0653518.

F18. Presenter: Brianna Dillon, Lehigh University, REU '08, *DillonBS1@gcc.edu*
Authors: Brianna Dillon, Dr. Jean Toulouse, Advisor; Lehigh University
Poster Title: **Loss Characterization of Tellurite Fibers**

Abstract: Tellurite glass fibers show promise for a variety of applications due to their low loss in the far infrared region of transmission, high rare-earth ion solubility, and enhanced nonlinear properties. This poster describes the loss characterization of tellurite fibers drawn at Lehigh University, performed to provide feedback to aid in perfecting the preform preparation and the subsequent fiber drawing. Background information on the design and pertinent characteristics of optical fibers is given, along with a description of the loss characterization procedure. Finally, fiber quality resulting from two different drawing processes is compared, and loss variations observed within one drawing process is discussed.

F19. Presenter: Shaun Mills, Boston College, Grove City College, *millssa1@gcc.edu*
Authors: Dr. Zhifeng Ren, Trilochan Paudel, Shaun Mills; Boston College, Grove City College
Poster Title: **Optical Transmission and Reflection of Carbon Nanotube Arrays**

Abstract: This poster describes our investigation into some of the optical properties of hexagonal arrays of vertically aligned carbon nanotubes. The nanotubes were grown on a layer of titanium approximately 20 nanometers thick on top of a glass substrate approximately 0.7 millimeters thick using a Plasma Enhanced Chemical Vapor Deposition (PECVD) system. The tubes diameters were roughly 200 nanometers, and their heights were roughly 2.5micrometers. We used an ellipsometer to measure the percentages of incident light that were reflected off of and transmitted through the array of nanotubes over a broad range of primarily optical frequencies. Initial analysis of ourresults suggest the particular spacing chosen for our nanotube array is most effective for absorbing light with a wavelength of approximately 700nanometers. It is the hope of our research team that an array of vertically aligned nanotubes (with the spacing between individual tubes properly selected) might prove to be more efficient at gathering incident electromagnetic radiation than conventional technologies.

F20. Presenter: Ricardo Velez, University of MassachusettsBoston, *ricardo.velez@umb.edu*
Authors: Ricardo Velez and Steven D. Woodruff; University of Massachusetts-Boston
Poster Title: **Raman-based Spectroscopy for Monitoring Natural Gas Composition**

Abstract: A Raman-based optical sensor was developed using two different optical cells as cavities for gas sample and Stokes light collection; a hollow core photonic crystal fiber and an internal silver coated capillary. A 532nm laser source was used for Raman excitation of methane, carbon monoxide and hydrogen. The backscattered light of these samples was collected and focused into a grating spectrometer for processing and analysis. The results of the Raman response for each tested gas, using both fibers, are presented and discussed here. This project was conducted at the National Energy & Technology Laboratory (NETL) in Morgantown, WV.

Optical Physics (continued)

F21. Presenter: Justin Hugon, Cornell University, *hugjl@rhodes.edu*
Authors: Justin Hugon, Donald Bilderback, Heung-Soo Lee, Tom Szebenyi; Cornell University
Poster Title: **Vibration Reduction in X-ray Capillary Optic Fabrication**

Abstract: Glass capillary optics are used to focus X-rays from synchrotron light sources. The quality of Cornell High Energy Synchrotron Source (CHESS) capillaries matches present generation light sources well, but improvements will be necessary to take advantage of planned facilities, such as the Energy Recovery Linac (ERL) at Cornell. The primary obstacles are small radius profile errors and centerline oscillations in capillaries drawn from constant-diameter glass tubing into an elliptical shape. This project focuses on minimizing mechanical vibrations in the capillary fabrication and analysis system. Capillary errors are compared before and after structural bracing additions; these additions were found to reduce errors and enable the drawing of some of the best capillary optics to date.

F22. Presenter: Allison McMahon, Angelo State University, *amcmahon@angelo.edu*
Authors: Allison McMahon, Toni Sauncy; Angelo State University
Title: **Construction of a cost effective optical tweezers manipulation of birefringent materials using circularly polarized light**

Abstract: Light manipulation is a very powerful tool in physics, biology, and chemistry. There are several physical principles underlying the apparatus known as the optical tweezers, the term given to using focused light to manipulate and control small objects. By carefully controlling the orientation and position of a focused laser beam, dielectric particles can be effectively trapped and manipulated. We have designed a cost efficient and effective undergraduate optical tweezers apparatus by using standard off the shelf components and starting with a standard undergraduate laboratory microscope. Images are recorded using a small CCD camera interfaced to a computer and controlled by LabVIEW TM software. By using wave plates to produce circular polarized light, rotational motion can be induced in small particles of birefringent materials such as calcite and mica.

Condensed Matter Physics

F23. Presenter: James Kristoff, Illinois State University, *jskrist@gmail.com*
Poster Title: **Turning Heat Into Electronics: Making Better Thermoelectrics**

Abstract: For nearly two hundred years we have known about materials that could be used to convert heat into electricity. However, these thermoelectric have been somewhat inefficient. The new field of nano-science has re-opened the search for higher efficiency to enable the recovery of waste heat from factories and automobiles and to enable new high efficiency refrigerators. Our focus is on the study the properties of silicon and germanium when they are combined in atomic layers at the nano-scale. We have constructed a special deposition system to make these new materials and plan to measure their properties as a function of layer composition and thickness.

F24. Presenter: Ashley Cetnar, Kansas State University, *cetnaraj1@gcc.edu*
Authors: Ashley Cetnar, Sreeram Cingarapu, Dr. Kenneth J. Klabunde; Kansas State University
Poster Title: **Kinetics of Gold Nanoparticle Formation**

Abstract: My objective was to understand the chemical details of an important method of producing mono-disperse nanoparticles. The nanoparticles synthesized are gold ligated by thiol ligands. The nanoparticles average 5nanometers in diameter with about 5000 gold atoms and 600 thiol ligands per particle. The two methods used to prepare the particles are the solvated metal atom dispersion method and the inverse micelle method. Both processes break the gold into nanoparticles and are ligated to protect the particles from aggregation. After the nanoparticles are produced they are made mono-disperse by digestive ripening. Digestive ripening occurs when the poly-dispersed product is refluxed over time. During this illusive procedure the multi-sized particles all become uniform in size. During reflux, the samples are analyzed by UV spectroscopy. The spectroscopy reveals a plasmon emitted from the nanoparticles at 530 nm from a standard sample of 1:30 gold to ligand ratio. During the reflux procedure, the gold Plasmon peak narrows and the peak becomes steeper. Over time, the peak of the Plasmon seems to be red shifted. As the amount of ligand was varied the gold plasmon appeared to shift. This research opportunity was made possible by the National Science Foundation REU program.

F25. Presenter: Daniel Jumper, Abilene Christian University, *dxj05a@acu.edu*
Authors: Daniel Jumper; Abilene Christian University
Poster Title: **Measuring CaWO4 Elastic Constants by Imaging Phonons**

Abstract: Calcium Tungstate is a scintillating crystal that has potential application as a detector in searching for WIMP s. For this use to be realized we must better understand the crystals vibrational properties. Phonon imaging is a process of studying heat vibration through a crystal. When cooled to a low temperature, heat (phonons) can travel millimeter distances through a crystal without scattering. Due to the anisotropic nature of crystal structure, phonon velocity and intensity varies depending on the direction of propagation. To study this effect, a superconducting bolometer is used to detect phonons on one crystal face and a scanning laser is used to create point-like heat sources at various positions on the opposite face. In this manner it is possible to compile an array of measurements of phonon intensity over a range of directions. This image contains important information that can be used to better characterize the elastic constants of CaWO4 and thus make progress towards its use in future experiments.

Condensed Matter Physics (continued)

F26. Presenter: Amy Frantz, Juniata College, *frantae07@juniata.edu*
Authors: Amy Frantz, Brad Dinardo,Kenny Goodfellow, and James D. White; Juniata College
Poster Title: **Temperature Dependence of Doppler-broadening for Rubidium Absorption**

Abstract: An experiment was conducted in order to determine the temperature dependence of Doppler Broadening of Gaussian wells caused by the absorption of monochromatic light in a rubidium vapor cell. In order to study this effect, a 780nm diode laser was used to excite atoms of Rubidium-85and Rubidium-87 from their ground state to their first excited state. Data were collected over a range of temperatures of rubidium. Gaussian wells were then fitted to match the experimental data. It was found, as in accordance with theory, that the broadening of the Gaussian Wells, as measured from their full width at half maximum, is dependent on the square root of temperature of the atoms. Summer internships were supported by NSF RUI Phy-0653518.

F27. Presenter: Amanda J. Havel, Coe College, *ajhavel@coe.edu*
Authors: A. J. Havel, M. Karns, M. Karns, S. A. Feller, and M. Affatigato; Coe College
Poster Title: **Design and Operation of a New Roller Quencher for Rapidly Cooling Melts into Glasses**

Abstract: We discuss the design and construction of a new roller quencher that is capable of cooling liquids up to $1.8x10^6$ K/s. The new roller quencher is based on refinements to our proven twin-roller designs [1]. This new generation of machines will have a number of advantages over the existing ones including digital control of the rollers speed and gap adjustment, the ability to control the atmosphere over the resulting glass samples, ease of cleaning, and size. We also discuss the use of roller quenching at Coe College to form borate, and other glasses.

F28. Presenter: Tyler Mullenbach and Maranda Franke, CoeCollege, *TKMULLEN@coe.edu & MAFRANKE@coe.edu,* Authors: T. Mullenbach, M. Franke, A. Ramm, A. R. Betzen, S. Kapoor, N. Lower, T. Munhollon, M. Berman, M. Affatigato & S. A. Feller
Poster Title: **Structural Determination of Alkaline-Earth Borosilicate GlassesThrough Density Modeling**

Abstract: The densities of nearly 120 alkaline-earth borosilicate glasses were determined using pycnometry. These results were used to make inferences about the underlying atomic level structure of alkaline-earth borosilicate glasses. Density models were created that utilized proportional sharing and the structural hypotheses of Dell, Bray, and Xiao. A sharing of alkaline-earth oxide amongst the borate and silicate networks was observed along with evidence that may suggest inaccuracies in the Dell hypotheses.

F29. Presenter: Amy Marquardt, Coe College, *aemarqua@coe.edu*
Authors: Amy Marquardt, Matt Roberts, Steve Feller, Steve Singleton, Mario Affatigato; Coe College
Poster Title: **Structural Effects of Europium on Lead Borate Glasses**

Abstract: We report on our studies of the structure of lead metaborate glasses doped with europium oxide (Eu2O3) up to 15 molar percent. Measurements of the samples using laser ionization time of flight mass spectrometry revealed an isolated role for single Eu+3 ions and a preference for sites near(B3O6) rings. The relative isolation of the europium modifiers was confirmed by infrared spectroscopy and UV/visible absorbance and fluorescence. The impact on the lead borate network was limited to an increase in the fraction of three-coordinated boron oxide units and an increase in lead-rich units. Fluorescence measurements suggest a stable (+3) oxidation state for the europium ions, and very little change in the fluorescence emission lifetime. The stable borate sites (near rings) occupied by the Eu and its high-field strength are possible explanations.

F30. Presenter: W. Tyler McCleery, University of SouthernMississippi, *alina.gearba@usm.edu*
Authors: Gregory Carson, W. Tyler McCleery, Dwana King and Randall Dannemann; University of Southern Mississippi
Poster Title**: Characterization of a Rubidium Magneto-Optical Trap**

Abstract: The University of Southern Mississippi Chapter of the Society of Physics Students is one of the 2007 Sigma Pi Sigma Undergraduate Research Award recipients. Our proposed research program involved a systematic characterization of a rubidium magneto-optical trap, performed under Dr.Alina Gearba's supervision, the SPS faculty advisor. In Dr. Gearba's research laboratory, rubidium atoms were cooled and trapped in a standard magneto-optical trap, to temperatures 1/10,000 of a degree above absolute zero. The fluorescence emitted by the cold atoms was measured with a calibrated photodetector subtending a known solid angle, while a high-speed video camera connected to a computer via an image acquisition board was used to monitor the size and the shape of the atomic cloud. The experimental results characterizing the behavior of the cold atoms in the magneto-optical trap such as total number of trapped atoms, size of the cold atomic cloud, atomic density and lifetime will be presented at the meeting. The SPS members involved in this project, while dealing with an innovative field of scientific research, sharpened their experimental and problem-solving skills needed in navigating the physics community as a whole.

F31. Presenter: Adam Patch, Boston University, *patch@bu.edu*
Authors: Adam Patch, Matthias Imboden, Pritiraj Mohanty; Boston University
Poster Title: **Dynamics of nanomechanical polycrystalline diamond resonators**

Abstract: This project explores the dynamics of polycrystalline diamond resonators. At high temperatures (between 230 and 290 K), we have determined the frequency and dissipation scaling laws for doubly clamped beam resonators and identified the dominant dissipation mechanisms in this parameter space. At low temperatures (less than 40 mK - 6K), we have detected the effect of low-lying energy defects (two-level-systems) as the intrinsic dissipation source of polycrystalline resonators with resonance frequencies in the MHz range. By comparing our results with those from similar structures made of silicon and gallium arsenide we were able to identify universality trends for the dissipation and sound velocity behavior at low temperatures. We fabricate our nano-mechanical oscillators using standard e-beam lithography and surface nanomachining.

Condensed Matter Physics (continued)

F32. Presenter: Scott Dietrich, Boston University, *scottad@bu.edu*
Authors: George Zimmerman, Boston University
Poster Title: **Experimental and Theoretical Investigation of High Temperature Superconductors**

Abstract: One of the questions about HTS materials is their chemical stability under various conditions and their behavior in the intermediate state between superconductivity and normal conductor or semiconductor behavior. Two examples of this material, YBCO and BSCCO polycrystalline samples, will be used in the study. This research will examine the properties of different samples of superconducting material by making several simultaneous measurements. For each sample we will be measuring the low frequency magnetic susceptibility, which gives information about the character of superconducting material in the sample, the resistivity which might indicate the connectivity of the superconducting domains and its ability to carry electric current at various temperatures above its critical temperature. Specific and periodic analysis and maintenance will also be performed. We will apply a high temperature annealing method in air and an oxygen rich atmosphere to see if the procedure changes the properties of the material The process will be repeated with various samples in order to comprehend whether the electric current changes the properties of the sample. Data collection from various samples will aid the development of a simulation of superconducting material.

F33. Presenter: Travis Rasor, Rhodes College, *rastl@rhodes.edu*
Authors: Dr. Shubho Banerjee, Travis Rasor; Rhodes College
Poster Title: **Modeling the shape of magnetic liquids using computer simulations**

Abstract: A magnetic liquid is a chaotic collection of constantly moving magnetic particles. These particles are unable to align themselves and exert a detectable magnetic field without first transitioning into a solid. Much research has already been done into the creation of a liquid that is orderly without first transitioning into a solid. Ordered magnetic liquids have been predicted theoretically, but never observed experimentally. But what would a drop of magnetic liquid look like? Our main goal was to determine the shape of a freely suspended magnetic liquid drop using computer simulations. Using Surface Evolver we successfully constructed a model of a magnetic liquid drop and determined several possible shapes.

F34. Presenter: Jason Czak, Penn State, *tmj143@psu.edu*
Authors: Jason Czak; Michael Janik; , Sally Wasileski; Penn State
Poster Title: **Density Functional Theory**

Abstract: This poster will be comprised of an outline of computational quantum mechanics. The poster will contain an overview the applications of proton exchange membrane fuel cells and their connection to the technologically advancing world. The fundamental science behind fuel cells will be displayed and discussed. The poster will also contain current research in the computational field provided by the PSU Janik group.

F35. Presenter: Daniel S. Taylor, Angelo State University, *dtaylor3@angelo.edu*
Authors: Daniel S. Taylor, Dr. Toni Sauncy; Angelo State University
Poster Title: **Use of a non-contact synthesis method in selective area porous silicon thin film formation**

Abstract: Porous silicon (p-Si) is a unique form crystalline silicon (c-Si), composed of a matrix of thin-walled c-Si surrounding numerous voids. Interest in the study of this structure was initially spurred by the observation of visible luminescence the well-known indirect band gap material. For pore formation, we utilized stain etching, a non-contact method of synthesizing p-Si. A 20-mW He-Ne (632.8nm) laser is used to produce a local electric field on the c-Si surface while the sample is immersed in hydrofluoric acid; this laser generated field is in lieu of the traditional applied voltage used in the standard contact technique. Our objective with this study was to investigate the efficacy of beam manipulation to produce selective patterned regions of p-Si thin film on the crystalline surface. Variation in patterning techniques, processing time and dopant type, along with optical and electrical characterization of the processed samples will be discussed.

F36. Presenter: Ben Franta, Coe College, *bafranta@coe.edu*
Authors: Ben Franta, Landon Tweeton, Steve Feller, Mario Affatigato; Coe College
Poster Title**: Laser Induced Modification of Alkali Borate Glasses**

Abstract: We report on the effects of 785 nm light irradiation on copper doped alkali borate glasses. Glasses of the chemical formula y(CuO).(1-y)[x(Z2O).(1-x)(B2O3)] were made, with y = 0.05, 0.1 < x < 0.5, and Z representing either Li or Cs. Modification of the surface, including crystallization, was measured as a function of laser power and sample composition. Laser-drawn surface patterning and spheroidization were also performed. Scanning electron microscopy, atomic force microscopy, micro-Raman spectroscopy, and x-ray fluorescence spectroscopy were used to characterize the changes induced by the laser light.

F37. Presenter: Alonzo Barkley, Coe College, *alonzo.barkley@simpson.edu*
Authors: Alonzo Barkley and Dr. Mario Affatigato; Coe College
Poster Title: **Properties of Bismuth Glasses at Compositional Extremes**

Abstract: This study investigated bismuth glasses at compositional extremes. In this study both bismuth silicate and bismuth borate glasses were studied through the use of a differential scanning calorimeter, a Raman spectrometer and a scanning electron microscope. A disappearing Tg was explored in high bismuth content bismuth silicate glasses and phase separation was explored in low bismuth content bismuth borate glasses.

Condensed Matter Physics (continued)

F38. Presenter: Henry Schreiner, Angelo State University, *henryschreiner@yahoo.com*
Authors: Henry Schreiner,Jung-Hwan Song, Nicholas Hatcher, and Arthur J. Freeman; Angelo State University
Poster Title: **Electronic Structure Calculations of NiTi Based Ternary Systems**

Abstract: In this study, the electronic structures of ternary nickel titanium shape memory alloys were investigated using a first principles approach within density functional theory. We used the full potential linearized augmented plane wave (FLAPW) method for all calculations, and developed models of the alloys NiTiCu, NiTiFe, and NiTiPd. Both the B2 and the B19phases for these systems were modeled to determine phase energetics and fundamental mechanisms for structural preference. Splitting of Ni d-states due to Cu and Pd additions and total energy comparisons of the phases explain the effect of ternary additions on changing martensitic transition temperatures. Total energy analysis was used to predict the ground state phase change of NiTiCu B19 to B19 as Cu content increases from 12 at% to 25at%, which is consistent with recent experiments. Site preferences for Cu and Fe were investigated for same composition alloys. From these results and by predicting alloy properties from first principles, we show how these ab initio calculation methods may be used for designing novel materials.

F39. Presenter: James Matthews, Angelo State University, *jrm1184@msn.com*
Authors: James Matthews, Ganapathy Sivakumar, and Tim Dallas; Angelo State University
Poster Title: **Characterization and Design of Two-Axis Bi-Directional Microstages**

Abstract: Micro Electro Mechanical Systems (MEMS) are critical components of many cutting edge technologies. We are developing novel microstages for positioning and scanning applications. The microdevices are fabricated using Sandia National Laboratory s SUMMiT V MEMS foundry process. We present the tested performance of a two-axis, bi-directional stage system that is actuated using electrostatic forces. The stage has a maximum travel of ~40microns in both axes and is capable of simultaneous actuation in both X and Y directions. Other characterizations focus on stiction and friction forces within the device and operating the device at high frequencies. Based on the results of these tests, we have made some major design changes to increase the maximum travel of the stages. A new design for a long distance travel stage is also presented. This design provides two-axis, bi-directional motion with a maximum displacement of ~1000microns in both axes. Other design changes are also presented which will improve the overall functionality of the device.

F40. Presenter: Kunal Bhatnagar, Angelo State University, *kbhatnagar@angelo.edu*
Authors: Kunal Bhatnagar, Dr. Nhan Nguyen; Angelo State University
Poster Title: **Interfacial Barrier Height by Internal Photoemission for Metal/Oxide/Semiconductor Structure**

Abstract: Internal Photoemission (IPE) is a powerful technique for investigating electronic properties at solid-solid interfaces and determining band offsets and alignments in MOS (Metal Oxide Semiconductor) structures. In the following research, new metal gate electrodes for MOS structures are investigated—a combinatorial Ni-Ti-Pt ternary thin film library on SiO2 and Si substrate. The zero-field barrier height is determined at the metal and oxide interface for Ni, Pt, Ti, and a compositional mixture of all the three metals using IPE characteristics. The barrier heights are then used to calculate the work function of the different metals to compare to the values obtained using C-V measurements. Interface barrier height at the metal-insulator interface is an important value, as it helps us better understand the structure and functioning of advanced CMOS devices which are a major component of today's computer chips and integrated circuits.

F41. Presenter: Matthew L. Clark, Southeast Missouri StateUniversity, *mlclark1s@semo.edu*
Authors: Matthew L. Clark, Margaret P. Hill, Southeast Missouri State University
Poster Title: **Development of a Resistivity Measurement System**

Abstract: In order to study the temperature dependence of resistance for various samples, we interfaced equipment to the computer using LabVIEW software. Resistance measurements were made using an offset-compensated technique which eliminates possible interference from thermal EMF for low resistance measurements. A sample of Ni2MnGa.80Al.20 was used to test the LabVIEW program over the temperature range from liquid nitrogen (~77K) to room temperature (~295K). Although the program proved to be stable while taking data, the resistivity data occasionally showed a high level of noise at some temperatures. Whether this issue stems from a problem with the LabVIEW program or sample mounting is unknown.

Condensed Matter Physics (continued)

F42. Presenter: Zachary J. Fifer, Penn State, *tmj143@psu.edu*
Authors: Fifer, Zachary J.; Hilt, Matthew G.; Maynard, J.D., Penn State
Poster Title: **Solid-State Heat Pump Utilizing the Electrocaloric Effect**

Abstract: The majority of cooling systems in use today utilize a gas compression cycle to move heat from one place to another. However, gases have relatively low specific heat, so refrigeration devices are often too bulky to implement in portable applications. In addition, the most efficient refrigerant gases in use today are harmful to the environment. Solids have a much greater specific heat than gases, and do not pose the same environmental threat. A solid state refrigeration device could be used to cool hazmat suits, remove heat from computer processors, and potentially replace the vapor compression devices in use today. This project s goal is to construct a prototype solid-state refrigeration device which utilizes the electro-caloric effect to transfer heat. The concept behind the device s design is based off of a thermoacoustic heat pump, a proven technology which uses oscillations in a system to transfer heat.

F43. Presenter: Jack Berkowitz, Coe College, *jaberkow@coe.edu*
Authors: Jack Berkowitz, Steve Feller, Mario Affatigato, Steve W. Martin, Diane Holland, Mark Smith, Tom Kemp; Coe College
Poster Title: **Elucidation of Quadrupole Parameters by Simulation of 10B NMR Powder Patterns**

Abstract: We developed a method of analyzing 10B NMR spectra, and then using exhaustive simulation procedures, fitted quadrupole parameters to them. Distributions of parameters are also accounted for. Experimental data for vitreous boron oxide, vitreous and crystalline cesium triborate, vitreous cesium diborate, crystalline potassium diborate, and cesium enneaborate have been fitted to yield their quadrupole parameters. There may be multiple sites within the spectra or just one. These may result from differences in short range order, or intermediate range structure. The asymmetry parameter (h) is particularly sensitive to differences in the environments of three-coordinated borons placed in differing intermediate range order positions.

Biophysics

F44. Presenter: Greggory McPherson, New Mexico StateUniversity, with, Jacob Urquidi, Jose Leo Banuelos
Poster Title: **A Structural Evaluation of Bone Stressors; Tracking Bone Mineral Distribution and Morphology with Anomalous and Scanning Small Angle X-ray Scattering,** *greggorymcpherson@gmail.com*

Abstract: In 2003, the CDC reported that 13,700 persons aged 65 and older were killed by traumatic falls; with another 1.8 million injured. Clearly, as average life span increases, musculoskeletal bone disorders are becoming a larger health care concern. Many of these maladies, such as Osteoporosis, inhibit the body's ability to generate new bone, and slowly allow existing tissue to be reabsorbed. This undermines the mechanical quality of bone and its ability to cope with stress. The mechanical quality of bone is largely due to the degree of mineralization of the collagen matrix with calcium-phosphate crystals. Our lab is investigating changes in these crystals' morphology, distribution and orientation with the onset of stress and disease using Anomalous Small Angle X-ray Scattering and Scanning Small Angle X-ray Scattering measurements. This entails performing scattering experiments near the absorption edges of Calcium and Phosphorous respectively, and taking the difference of the resulting spectra to obtain a scattering function for only the calcium-phosphate crystals in a given sample. Further, we will perform scattering measurements while controlling sample position relative to the beam to gain positional specificity for scattering data. With analysis, we hope to understand how ailing bone mineralization changes and thus how bones weakens.

F45. Presenter: Lauren Zimmerman, Carthage College, *lzimmerman@carthage.edu*
Authors: Lauren Zimmerman, Dr. Ken Ritchie; Carthage College and Purdue University
Poster Title: **Measuring the Membrane Properties of Diseased Red Blood Cells: Designing Magnetic Tweezers**

Abstract: The cell membranes of red blood cells in humans are important in maintaining cell structure. A key part of the membrane structure is provided by a six-fold mesh-like network consisting of proteins called band 3 and spectrin. Several hereditary diseases that affect red blood cells cause this six-fold network to break apart or stiffen. We want to measure the effects of these diseases on the membrane's compressibility constant (a measure of stiffness, similar to a spring constant). The first stage of this project was to design "magnetic tweezers". An electromagnet was designed that could provide enough force to effectively pull on microscopic magnetic probes attached to Band 3 proteins in the network. In preliminary experiments unhealthy cells, it was shown that a computer tracking systems is able to analyze the movement of the magnetic probes due to the force provided by the magnetic tweezers. From this data, the compressibility constants of the red blood cell network can be determined. Using this design we hope to probe the properties of red blood cells with hereditary spherocytosis, elliptocytosis, pyropoikilocytosis, and sickle cell.

F46. Presenter: Jennifer Hansen, Grove City College, *HansenJL1@gcc.edu*
Authors: Jennifer L. Hansen, F. Peter Guengerich , Martha V. Martin , and Glenn A. Marsch; Grove City College, and Center in Molecular Toxicology, Vanderbilt University
Title: **Interaction of Human Cytochrome P450 3A4 with Hydrophobicity Probe Nile Red Shows Heterogeneous, Strong Binding.**

Abstract: Human cytochrome P450 3A4 (CYP 3A4) binds an unusually wide variety of substrates, and metabolizes about 50% of all drugs. Steady-state fluorescence spectra were acquired for complexes of CYP 3A4 and the fluorescence probe Nile Red. Difference fluorescence spectra and Hill plots were generated, and Hill coefficients were determined. The fluorescence from multiple Nile Red bound states was observed, with all bound states having higher emission energies than the fluorescence from free Nile Red. Nile Red was titrated into 150nM CYP 3A4, with fluorescence difference spectra showing the quenching of CYP 3A4 tryptophan fluorescence. The dissociation constant showed tight binding, with Kd = 44nM. Good fits to the Hill plots were obtained with n = 1, suggesting non-cooperative binding.CYP 3A4 was also added to Nile Red, and changes in the Nile Red fluorescence spectra were monitored. Difference spectra and Hill parameters Kd and n are to be determined. This study of the interaction between NR and 3A4 revealed strong, heterogeneous, non-cooperative binding of Nile Red to CYP3A4.

Biophysics (continued)

F47. Presenter: David E. Smith, Jonathan A. Guglielmon, Grove City College, *smithde1@gcc.edu*
Authors: David E. Smith, Jonathan A. Guglielmon, F. Peter Guengerich,Glenn A. Marsch; Grove City College
Poster Title: **In Silico Docking of Ligands to Drug Oxidation Enzymes Cytochrome P450 3A4 and Cytochrome P450 1A2.**

Abstract: Cytochrome P450 3A4 (CYP 3A4) and cytochrome P4501A2 (CYP 1A2) oxidize most drugs in humans. Protein modeling toolkits from OpenEye Scientific Software were used to examine the interaction of drug substrates with CYP 3A4 or CYP 1A2. Conformers and partial atomic charges were generated for each drug molecule. User-defined volumes were defined around CYP 3A4 and CYP 1A2 active sites. Ligands were docked assuming that protein and substrates are rigid bodies. To assess rigid docking accuracy, x-ray diffraction coordinates of CYP 3A4-erythromycin and CYP3A4-metyrapone complexes were obtained. Rigid re-docking of either erythromycin or metyrapone into CYP 3A4 yielded poses similar to the crystal structures. Rigid docking revealed two other energetically favorable CYP3A4 - metyrapone poses. The best poses were obtained by using all the OpenEye scoring functions. Optimization of protein-ligand interactions within 5-10 ? of the docked ligand was then calculated using the Merck Molecular Force Field. Here both ligand and protein are assumed to be flexible and relax to optimize the geometry of the interaction. The CYP backbone and aromatic amino acid rings pulled slightly closer to the substrate, possibly reducing the volume of the CYP protein.

F48. Presenter: Benjamin T. Carlson, Grove City College, *carlsonbt1@gcc.edu*
Authorss: Benjamin T. Carlson, Glenn A. Marsch, Martha V. Martin, and F. Peter Guengerich, Grove City College, PA; and Center in Molecular Toxicology, Vanderbilt University Medical School, Nashville, TN
Poster Title: **Hill Parameters and Heterogeneity of alpha-Naphthoflavone Binding to Human Cytochrome P450 3A4 by Fluorescence Spectroscopic Analysis**

Abstract: Human cytochrome P450 3A4 (CYP 3A4) is an alpha-helical membrane-bound protein in the liver and small intestine that metabolizes approximately50% of all drugs. The interaction between CYP450 3A4 and alpha-naphthoflavone (ANF) was characterized using fluorescence methods. ANF quenched fluorescence from tryptophan residues in CYP 3A4, and CYP 3A4 quenched the fluorescence from bound ANF. The ANF fluorescence emissionenergy was unchanged upon binding to CYP 3A4, implying that enzymebound3A4 is completely quenched. Fluorescence difference spectra yielded plots which were fit to the Hill equation by varying the parameters Kd and n. For quenching of tryptophan fluorescence by ANF, no significant sigmoidal behavior was observed with n=1, and the dissociation constant revealed a strong ANF-CYP 3A4 interaction (Kd=27nM). Modest cooperativity was observed in the quenching of ANF fluorescence by CYP 3A4, with n=1.4. The spectral dissociation constant revealed very tight binding, with Kd=4.9nM. Fluorescence polarization anisotropy showed that anisotropy <r>decreased at low ANF/CYP 3A4 molar ratios; then <r> increased at higher ratios. Compared to substrate-free CYP 3A4, adding substrate at low molar ratios increases the CYP 3A4 molecular rotation rate, suggesting CYP 3A4molecular volume decreases.

F49. Presenter: Matt Noll, Penn State, *tmj143@psu.edu*
Authors: Noll, Matt; Dieterich, Sonja; Sawant, Amit; Penn State
Poster Title: **Comparative dosimetry of pancreas stereotactic body radio surgery on Cyberknife and Trilogy**

Abstract: Image guided radiation therapy (IGRT) techniques are often utilizedin modern cancer treatments to account for patient motion. TheCyberknife (Accuray, Sunnyvale CA) uses and LED imaging system combinedwith orthogonal X-ray images to monitor a patient's motion during treatment and the robotic arm can make correction movements when the target motion is considerable. A method is currently being developed for the Trilogy (Varian Medical Systems, Palo Alto CA) that utilizes the onboard Xray imaging Real-Time Position Management (RPM) system to run a Dynamic Multi Leaf Collimator, which can account for transverse, rotationaland axial motion. A dosimetric comparison was attempted for these two techniques; Cyberknife log data from 6 patients treated for pancreatic disease was used to drive a robotic motion platform. EBT film was placed in a phantom, which was attached to the motion platform and subsequently treated under the patient specific plan. Unfortunately due to software and time limitations, no trials were completed on the Cyberknife and only trial was completed on the Trilogy. Data is currently being analyzed. This project was completed during the American Association of Physicist in Medicine(AAPM) Summer Undergraduate Fellowship Program.

F50. Presenter: Joshua Fuchs, Rhodes College, *fucjt@rhodes.edu*
Authors: Joshua Fuchs, Anthony Bendinelli, Patrick Lawlor, George T.Shubeita; Rhodes College
Poster Title: **Temperature effects on in vivo function of molecular motors**

Abstract: Molecular motors are the primary long distance active transport mechanisms inside the cell. Since a typical cargo is a few hundred nanometers in size, relying on diffusion to move it to where it is needed in the crowded environment of the cell would not be efficient. Molecular motors exist to haul the cargo along microtubules to the destination. This work was focused on two of these motors, kinesin and dynein, and their motion in Drosophila embryos. In an effort to better characterize motor function inside cells, we investigated how motor speeds changed with temperature within living embryos. We found a drastic decrease in speed upon cooling the embryos by six degrees.

F51. Presenter: A.J. Salois, University of Arkansas, *aj.salois@gmail.com*
Authors: A. J. Salois, M. Dickson, A. Froyd-Rankenberg, D. Greathouse, W.F. Oliver; University of Arkansas
Poster Title: **Study of Peptide to Lipid Membrane Interactions using Dynamic Light Scattering and Fluorescence Properties**

Abstract: Vesicles were made using DMPC and the peptide Lipin 1, and DMPC and Lipin 2, with the overall goal of understanding the interactions between these peptides and membranes. Vesicles were chosen as model membranes for initial studies. Vesicle diameters with and without Lipin 2were compared using dynamic light scattering (DLS) to determine possible interactions between the peptides and the membrane. Both 100-nm and 1000-nm vesicles were made with either Lipin 1 or Lipin 2 peptides, and with appropriate fluorescent labels. These samples were analyzed with fluorescent microscopy for possible signs of interactions and degradation. Preliminary results indicate that the vesicles made without the peptide Lipin 2 were approximately 5% larger than those made with the peptide. This small difference may or may not be significant to the overall goals of the project. Fluorescence microscopy reveals strong uniformity in vesicle shape and size among those made of lipids and those that also contain peptides. As of now, there is little evidence that the peptides Lipin 1 or Lipin 2 cause a degradation of the vesicle membranes.