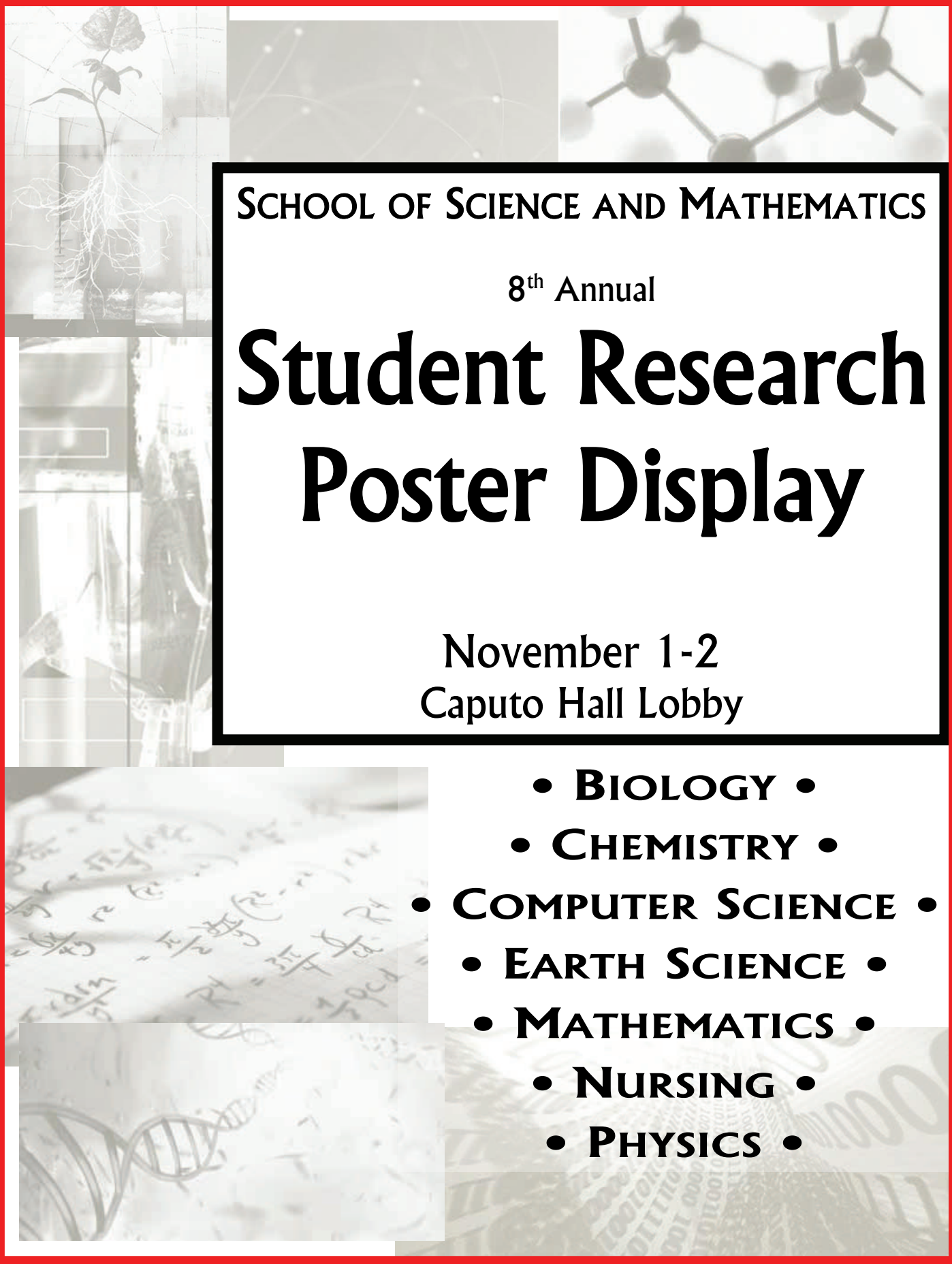

SCHOOL OF SCIENCE AND MATHEMATICS

8th Annual

Student Research Poster Display

November 1-2

Caputo Hall Lobby

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- CHEMISTRY -
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Note: The names of Millersville University faculty advisors are designated by an asterisk (*) in the abstracts.

Biology

1. Biogeography and Predictive Niche-Modeling of Invasive or Non-Native North American Species of Dayflower (*Commelina*, Commelinaceae)

Brakeall, John; Sloat, Lindsey (MU 2006); Hardy, Christopher R.*
Department of Biology, Millersville University, Millersville, PA 17551
James C. Parks Herbarium

There are nine species of *Commelina* in the Flora of North America, three of which are native, and six of which are non-native. Of the non-native species, two or three are considered invasive. The objective of this study was to identify the geographic origins, estimate climatic envelopes, and determine rates of biogeographic spread of invasive *Commelina* species within North America. We used innovative georeferencing software and GIS programs to model species ranges and make predictions about states and counties open to invasion. The results of this study may facilitate efforts to mitigate the spread of invasive species, which generally are regarded as one of the main reasons for loss in biodiversity and crop yields.

2. Relative Efficacy of Surveyor and Mung Bean Nuclease at Detecting Point Mutations in the Androgen Receptor Gene

Rice, Shawn; Hepfer, Carol E.*
Department of Biology, Millersville University, Millersville, PA 17551

Complete androgen insensitivity syndrome (CAIS) is caused by a defect in the androgen receptor (AR) gene located on the X chromosome. Androgens are essential for proper development of primary and secondary male sexual characteristics. Although individuals with CAIS have an XY genotype, they do not respond to androgens and express an external female phenotype. Previous studies have identified more than 300 CAIS-associated mutations that span the entire AR gene. Due to the vast number of possible mutations and the fact that most gene defects responsible for this syndrome are subtle, efficiently identifying carriers of defective AR genes has been impossible. To develop a simple, inexpensive, and reliable mutation detection test for the AR gene, we evaluated strategies based on enzymatic mismatch cleavage (EMC). Surveyor and mung bean nuclease are two mismatch-specific endonucleases capable of cleaving DNA at mispaired nucleotides in heteroduplexes containing one normal and one mutated DNA strand. Activities of these enzymes were optimized and compared for their ability to detect point mutations in genetically engineered exons of the AR gene and for reliability in detecting carriers in a family with a history of CAIS. Surveyor was more sensitive than mung bean nuclease at detecting various types of mutations. Both nucleases performed equally well at identifying carriers and CAIS-affected individuals in study subjects. EMC-based methods utilizing Surveyor or mung bean nuclease can effectively detect CAIS-associated alleles in carriers and affected individuals. The methods developed through this investigation should be

readily applicable for the detection of other defective AR alleles, and this information could assist physicians and genetic counselors in advising families with CAIS.

3. The Role of Neural Crest Cells in the Formation of the Turtle Shell

Terrell, Anne; Cebra-Thomas, Judith A.*
Department of Biology, Millersville University, Millersville, PA 17551

The purpose of this research was to investigate the formation of the lower half of the turtle shell, the plastron. The plastron bones of turtles are unique because instead of being formed by the calcification of cartilage, like skeletal bones, they are formed like the bone in the skull. The bones of the skull are produced by neural crest cells, a migrating cell population that originates in the neural tube (the precursor of the central nervous system). Our hypothesis is that the plastron is formed by neural crest cells, similar to those in the head, migrating away from the neural tube. To see if we have a unique population of neural crest cells in turtles, we first needed to demonstrate that cells were migrating away from the neural tube in later stage turtle embryos. We took two approaches: (1) to inject dye into the neural tube, and (2) to isolate and culture the neural tube from turtle embryos. We observe cells migrating away from the neural tube by both methods. Antibody staining, using neural crest cell markers, was then done to investigate the characteristics of the migrating cells. The migrating cells expressed both HNK-1, a marker for all neural crest cells, and PDGFRa, a marker for the bone-forming cranial neural crest cells in the head. The dye injection, neural tube isolation and antibody staining experiments all provided evidence to support our hypothesis that the plastron is formed by late-migrating, cranial-like neural crest cells.

Chemistry

4. Functionalized Polylactic Acid Micro- and Nanoparticles for Targeted Drug Delivery

Peurifoy, Steve; Mbindyo, Jeremiah K. N.*
Department of Chemistry, Millersville University, Millersville, PA 17551

There is great interest in developing techniques for functionalizing biodegradable drug loaded nanoparticles with receptor targeting molecules. Polylactic acid is a polymer that is commonly used to encapsulate drugs for controlled release. However, the polymer does not have reactive surface groups for conjugation of ligands. We used layer by layer (LbL) self assembly to introduce amine groups on the surface of polyactic acid micro- and nanoparticles. Optimal conditions for formation of the layer by layer films were investigated by monitoring growth of films on quartz using UV-Vis spectroscopy. Scanning electron microscopy (SEM), atomic force microscopy (AFM), optical and fluorescence microscopy were used to characterize functionalized and non functionalized nanoparticles. Results show formation of a surface active film on the micro- and nanoparticles that can be used to conjugate ligand molecules.

5. Improved Data Analysis for a Classic Kinetics Experiment

Smith, Kyle; Iannone, Mark A.*
Department of Chemistry, Millersville University, Millersville, PA 17551

The catalyzed decomposition rate of hydrogen peroxide is often measured in kinetics experiments. For instance, the maximum rate in an adiabatic system can be used to find the order of the reaction with respect to the catalyst. We realized that the temperature vs. time data could be analyzed in detail to obtain other thermodynamic and kinetic data.
In our experiment, decomposition of hydrogen peroxide was catalyzed by $Cr_2O_7^{-2}$ in a Dewar flask and the temperature was recorded as a function of time. The temperature data were corrected for heat loss. The heat capacity of the reaction system was measured by addition of a known amount of water. The temperature was used to calculate the concentration of hydrogen peroxide at each point in time during the reaction, from which the instantaneous reaction rates and rate constants were found. The enthalpy of reaction, ΔH, was calculated from the total temperature rise and heat capacity, while the activation energy was determined from a plot of the Arrhenius equation (ln k vs. 1/T).

Computer Science

6. Extending Microsoft's XNA Framework with Physics, Animation, and Sound

Hollinger, Jordan M.; Rittle, James H.; Metzger, Robert A.;
Killian, William K.; Webster, Roger W.*; Zoppetti, Gary M.*
Department of Computer Science, Millersville University, Millersville, PA 17551

Microsoft developed the XNA Framework to simplify game development. It is fast becoming the most popular framework that allows enthusiasts, hobbyists, and academe to develop video games for the PC and Xbox 360. It lacks, however, critical elements for creating realistic and immersive games.
We are building our own framework on top of XNA to support rigid-body physics; animation; first- and third-person cameras; background and 3D sound; and scene management. Our physics and animation infrastructure will leverage Havok Physics and Animation, two products from the world's top physics middleware provider for the video game industry. Because Havok's software uses native C++, and XNA uses C#, we must develop a library that efficiently communicates between the unmanaged runtime system used by C++, and the managed system used by C#. This requires a careful design that minimizes communication, as every transition between the two systems is costly, and too many may render a game unplayable.

7. Interoperating Applications to Simulate a Self-Contained Real-World Economy for Security Training

Kunder, Justin; Perera, Pasan; Hardy, Nazli*
Department of Computer Science, Millersville University, Millersville, PA 17551

Using a SQL 2005 database with ASP.NET (a web application framework) and Visual Studio Environment 2008 (software package for developing ASP.NET applications), we created online banking and ecommerce software to provide training for security professionals. The banking software was developed, in conjunction with the shipping software, to allow the trainee to identify different vulnerabilities, assess how they affect the system, where to look for such vulnerabilities, and most importantly, how to fix it. We also developed a shipping application using MySQL and PHP to help provide a more realistic training environment.

8. Modeling, Simulation and Animation of Streetcars in Lancaster City

Sejas, Mat; Workman, Kevin; Rittle, James; Webster, Roger*; Howell, Jack[2]; Littlejohn, Simon[1]
Department of Computer Science, Millersville University, Millersville, PA 17551
[1]Department of Art, Millersville University, Millersville, PA 17551
[2]Lancaster Alliance Corporation, Lancaster, PA 17603

Dr. Roger Webster along with students Kevin Workman, Mat Sejas, James Rittle, and Simon Littlejohn are working with the Lancaster Streetcar Company, the City of Lancaster, RRTA, the Lancaster Parking Authority, and the private sector, to improve the transit system within Lancaster City to improve the lives of city residents and visitors. Dr. Webster and his students have built a simulation animation to show how streetcars would operate in downtown Lancaster. The models were built with 3DS max software and various textures of buildings, sidewalks, and streets on Queen street in the center of town. A 3D model of a streetcar was built and textured. The animation shows the streetcar traveling down Queen Street by the new convention center, by Issac's restaurant and towards Orange street. The video can be found at: http://www.thelancasterstreetcar.com/news.html (click on Media tab). The streetcar transit system will be a functional, authentic, convenient and dependable steel-wheeled streetcar system. This electric streetcar system will begin with a compact loop that stitches together a wide range of attractions. The streetcar loop starts at the Amtrak train station, by the Lancaster Barnstormers Clipper Stadium, the Fulton Opera House, the new Convention center, the Belvedere, and LGH.

9. Interactive Google Map Application to Mark Species Distribution School Campuses

Snyder, Mark; Boaman, Matt (MU 2006); Murillo, Tomas (MU 2006); Hardy, Nazli*; Hardy, Christopher R.*

Department of Computer Science, Millersville University, Millersville, PA 17551
Department of Biology, Millersville University, Millersville, PA 17551
James C. Parks Herbarium

An interdisciplinary biodiversity informatics project between the departments of Computer Science and Biology. Using the Google Maps API, SQL, PHP and Ajax, we have created an online mapping application to allow anyone to report and map the occurrences of trees on our University campus, although the database and site could be modified to map any species or thing of interest. Visitors to this site will be able to add precise locality records with the mouse onto aerial photo-maps of our campus. Additionally, visitors will be able to edit data and upload photos of plants. This application is easily portable to be used by other campuses. It is also scalable to more inclusive levels (e.g., states) where it can facilitate the monitoring of the health of native plant (or animal) populations (particularly those threatened or endangered species) and will help to track and to mitigate the spread of invasive plants (or animals) in the region.

Earth Sciences

10. Detection of Flooded Areas Using AMSR-E Observations

Davies; Alexander R.[123]; Zhan, Xiwu[2]; Kumar, Ajoy[1]*
[1]Department of Earth Sciences, Millersville University, Millersville, PA 17551
[2]NOAA, NESDIS, STAR, SMC, Camp Springs, MD
[3]Ernest Hollings Scholarship Program, ORISE/NOAA Office of Education, Oak Ridge, TN

The purpose of this study is to successfully identify flooded areas using satellite observations. As a means of doing this, Advanced Microwave Scanning Radiometer data from NASA's Earth Observing System (AMSR-E) is used for identification. Daily AMSR-E data has been complied for the period of time ranging from January 2008 through most of July 2008. The data is downloaded in a level 3 format, after which a series of manipulations must be preformed to covert the data format, apply the proper grid system, and build 3-day data composite in order to prepare the data for experimentation. Seven different wavelength-signals are used in the study to extract a flood index—the vertical and horizontal 6.9 GHz, 10.7 GHz, and 18GHz signals, along with the 36.5 GHz vertical signal. Using the Change Vector Analysis (change detection), along with various arrangements of the signals and their sequential structure, the hypothesis is that it is possible for flooded areas to be identified. Experiments using a band ratio of the 6.9 GHz horizontal frequency to the 36.5 GHz vertical frequency have confirmed that flood detection is possible using these techniques. In future research a statistical analysis will be developed to quantitatively verify these results with a ground truth. Additionally flood detection using a band ratio of the 6.9 GHz horizontal frequency to the 6.9 GHz vertical frequency will be analyzed.

11. De-tiding ADCP (Acoustic Doppler Current Profiler) Data

Gilchrist, Justin; Kumar, Ajoy*
Department of Earth Sciences, Millersville University, Millersville, PA 17551

An ADCP is an instrument that estimates horizontal and vertical water velocities as a function of depth. It uses Doppler Effect to measure the relative velocity by sending out three acoustic beams in different directions and collecting what parts of the beam are reflected back. The ADCP is mainly used to measure ocean currents at very high spatial and temporal scales. For this research, we obtained data collected by NASA Wallops scientists from a ship mounted ADCP, off the coast of Virginia. Our initial work will involve producing vector averaged ocean current s and later we will use Harmonic analysis to remove tidal influences from the vector averaged currents. Tides tend to obscure the actual coastal current velocities that are very useful in coastal ocean circulation studies. A specific application of our work will be to understand the sources of low oxygen waters that are observed to enter the Chesapeake Bay. The low oxygen waters tend to affect marine life like Oysters and Blue Crab in the Bay. This work is a collaboration between NASA Wallops, Marine Science Consortium (MSC) and Millersville.

12. Monitoring the Coastal Ocean Environment for Harmful Algal Blooms

McCormick, Brian; Hoyt, Katie (MU 2008); Kumar, Ajoy*
Department of Earth Sciences, Millersville University, Millersville, PA 17551

Karenia Brevis is a dinoflagellate that causes a Harmful Algal Bloom (HAB) off the West Coast of Florida. It's still unclear what conditions cause such a bloom. In this study we used satellite derived sea surface temperature and Chlorophyll fields to map the extent and timing of blooms caused by the dinoflagellate Karenia Brevis. Additionally we used modeled temperature cross sections to identify upwelling signatures. Our initial analysis was successful at identifying pre-existing blooms off the shelf of the West Coast of Florida in satellite temperature and color images. Strong upwelling signatures are also observed along 80^{o} W and 26^{o} N transects.

13. A Petrographic Catalog of Epidotes and Allanites from the Persimmon Creek Gneiss, Western North Carolina

Runkle, Timothy J.; Price, Jason R.*
Department of Earth Sciences, Millersville University, Millersville, PA 17551

The epidote-group minerals are common hosts of the radioactive elements uranium (U) and thorium (Th). The effects of radiation can be identified by damage to the crystal structure known as metamictization. It is also known that epidote-group minerals contain significant quantities of calcium (Ca) and that metamictization may increase their solubility. Because Ca bonds with dissolved CO_2 in the oceans to form calcite, epidote-group mineral weathering may influence the global carbon cycle.
This study identified allanite and epidote grains in thin sections of samples collected from the Persimmon Creek Gneiss, North Carolina. Unweathered epidote-group mineral grains were identified that contain a core displaying void space and a herringbone pattern. The herringbone pattern reflects the chemical zoning of the pre-metamictized allanite core, and the void space appears to be a result of the metamictization. This herringbone and void space texture was previously believed to be a manifestation of chemical weathering rather than metamictization alone. It was determined that the observed structure is a pre-chemical weathering feature and that the literature has not accounted for this factor.

14. Nursing Students Impaired by Sleep Deprivation: Implications for Students, Faculty, and Safe Practice

Bugosh, Valerie J.; Palmer, C. Virginia*
Department of Nursing, Millersville University, Millersville, PA 17551

Most schools of nursing have policies that address student impairment from drug and alcohol use, but fail to recognize the negative effects of fatigue and sleep deprivation as impairment. According to the literature, decision-making, clinical judgment, and cognitive function are adversely affected by sleep deprivation, thus causing the inability to practice safely. The purpose of this study was to determine the sleep habits of nursing students at a local community college, and increase faculty and student understanding of the effects of sleep deprivation. An informal questionnaire completed by first semester nursing students provided information about student sleep patterns, work habits, and impaired functioning from sleep deprivation. An information sheet about impairment from fatigue and sleep deprivation was provided to faculty and discussed at a monthly staff meeting. A voluntary workshop was offered to all nursing students to discuss the impact of sleep habits on health, cognitive functioning, and the provision of safe patient care. This study was an initial step in increasing faculty and student awareness of the effects of sleep deprivation.

Physics

15. Senior Research Preliminary Results

Borigo, Cody; Dougherty, Kevin; Scott, Darren

Good research raises as many questions as it answers. At the start of a research project, questions outnumber answers by far. This poster demonstrates questions that are being raised concerning the photovoltaic effect and normal modes of vibration, by the experimental projects of three Millersville University Physics majors.

16. The Study of Supernova Remnants in Infrared

Johnston, Matt; Hendrick, Sean P.*

A supernova is the death of a star by a massive explosion (~10^{28} megatons of TNT). Massive stars explode as nuclear fusion ceases in the core, and the star gravitationally collapses. White dwarf stars in binary systems can accrete mass from their companion and thermonuclearly detonate. Shock waves created travel through the star building the elements of the periodic table. These waves continue to expand, carrying energy and this freshly systhesized material into the surrounding interstellar medium (ISM) forming supernova remnants (SNRs) that can be studied in a variety of wavelengths in the electromagnetic spectrum. This project uses data gathered from NASA's Spitzer Space Telescope (SST) at several infrared (IR) wavelengths including 3.6, 4.5, 5.8, 8.0, 24, 70, and 160 micrometers. It is in these wavelengths that the emission of dust particles is able to be observed. Several SNRs in the Large Magellanic Cloud were observed to examine dust in the ISM, and to see if new dust has been formed in the wake of the shock wave. Images in IR were compared to X-ray images from NASA's Chandra X-ray Observatory and the flux, or energy per area, of the radiation was also calculated.

17. Calculation of the Electronic Structures of Sculptured Thin Films with Meep

Mease, Jon M.; Gilani, Tariq H.*
Department of Physics, Millersville University, Millersville, PA 17551

We endeavor to calculate the electronic structures of a class of nano-engineered materials called sculptured thin films (STFs). STFs are of great technological interest due to the precision by which their optical properties may be tuned. We will utilize the MIT Electromagnetic Equation Propagation (Meep) software libraries to perform computational experiments on proposed sculptured thin film designs. This research is a part of ongoing collaboration between the Millersville University Physics department and the Department of Engineering Science and Mechanical Engineering at Penn State University.

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Millersville University

SEIZE THE **OPPORTUNITY**