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OFFICE OF EDUCATIONAL PROGRAMS

2008 Summer Internship

Symposium and Poster Session

August 13-14, 2008

Office of Science
U.S. DEPARTMENT OF ENERGY

BROOKHAVEN
NATIONAL LABORATORY

managed for the U.S. Department of Energy
by Brookhaven Science Associates, a company
founded by Stony Brook University and Battelle

Office of Educational Programs

BROOKHAVEN NATIONAL LABORATORY

Bldg. 438
P.O. Box 5000
Upton, NY 11973-5000
631-344-7171
631-344-5832
kwwhite@bnl.gov

managed by Brookhaven Science Associates
for the U.S. Department of Energy

www.bnl.gov

August 14, 2008

Every year the Brookhaven National Laboratory has a surge in energy and enthusiasm as hundreds of students and faculty from across the nation join our ranks to conduct research in various fields of science, engineering, and technology. Brookhaven, a U.S. Department of Energy funded multi-discipline laboratory is marked by its world-class research, unique scientific capabilities, and an outstanding scientific and technical staff. Our summer guests find a welcoming environment that immerses them in a culturally rich and diverse global research community tackling some of the most challenging and intriguing scientific problems. Often, the relationships formed during these summer months last a lifetime resulting in long-term collaborations that benefit the individuals and the mission of the Department of Energy.

Hosting the many participants in the summer programs requires the support of multiple agencies, and the cooperation of hundreds of BNL employees. We extend our appreciation to the agencies for their support and the many Laboratory mentors, guest speakers, and tour guides who so graciously volunteer their time to our next generation of researchers, engineers, and technicians. It is also important to recognize the outstanding staff in the Office of Educational Programs. Their hard work, dedication to our participants, relationships with our researchers, and commitment to create a friendly, fun, and productive work environment is unparalleled. I extend my personal thanks to them for all that they do.

The resources provided by the DOE to BNL supports a base of workforce development and educational programs that facilitate new relationships and initiatives in collaboration with universities, school districts, industry, and other state and federal agencies. Programs such as these provide opportunities that motivate and stimulate our nation's youth to pursue careers in science, technology, and science education. The Office of Educational Programs works as a catalyst between the Laboratory scientific and technical community and the external educational community to advance collaborative initiatives between the two.

The Office of Educational Programs congratulates all of our program participants for their achievements and thanks the BNL staff for their commitment and energy in making the programs successful.

Sincerely, and on behalf of the Office of
Educational Programs staff,

Kenneth W. White

Kenneth White,
Manager, Office of Educational Programs
Brookhaven National Laboratory

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General Information

Brookhaven National Laboratory offers college and pre-college faculty and students many opportunities to participate in Laboratory educational programs. The programs administered by the Office of Educational Programs are primarily funded by the U.S. Department of Energy, Brookhaven Science Associates, and other federal and non-federal agencies.

Faculty and student research participation is welcomed in physical and life sciences, computer science and engineering, as well as in a variety of applied research areas relating to alternative energy, conservation, environmental technology, and national security. Visit our website at http://www.bnl.gov/education for application deadlines and more details. Following is a description of the programs managed by the Office of Educational Programs.

U.S. Department of Energy Programs

The U.S. Department of Energy (DOE) has established many national initiatives that pair participants with members of the scientific and professional staff at the DOE national laboratories in educational programs developed to give research experience in areas of biology, chemistry, physics, engineering, environmental science, nuclear medicine, applied mathematics, high- and low-energy particle accelerators, and science writing.

Science Undergraduate Laboratory Internship (SULI)

Science Undergraduate Laboratory Internships offer undergraduate students the opportunity to conduct research at national laboratories across the country. Interns participate in a cutting-edge scientific research program, directed by a BNL staff member.

Community College Institute (CCI)

Community College Institutes are conducted at national laboratories across the country. Each offers a ten-week summer research and educational experience for highly motivated community college students.

Faculty and Student Teams (FaST)

The Faculty and Student Teams Program offers faculty and student team appointments for the summer semester. A university faculty member and up to three students work side-by-side with members of the Brookhaven scientific and professional staff for a ten-week summer research experience. These appointments can develop into greater collaboration between Brookhaven and the university.

Pre-Service Teacher Program (PST)

Teachers in training are paired with scientist mentors as well as master teachers, and are immersed in the research environment to conduct cutting-edge science. Student teachers return to the classroom well grounded not only in the skills and knowledge base required of a scientist, but also in practical experience they can apply to a classroom environment.

DOE Academies Creating Teacher Scientists (DOE-ACTS)

This program provides special training and research experiences to in-service science, mathematics, and technology teachers at the DOE national laboratories. Participating teachers spend four or more weeks in the summer at Brookhaven. Participating teachers will be eligible to receive follow-on grants for projects to be carried out in their schools,

supporting equipment, and professional development through conferences. Teachers in the program participate for a total of three years with the end goal of becoming teacher-leaders.

Additional Brookhaven National Laboratory Programs

Graduate Research Internship Program (GRIP)
The Graduate Research Internship Program (GRIP) is designed for both Masters and PhD students in the life or physical sciences, computer science, engineering and mathematics. Students work in collaboration with a scientist from BNL. Work is on a mutually agreed project that may lead to a publication or may support the student's thesis or dissertation.

College Mini-Semester
The mini-semester offers exposure to cutting-edge science through science and technology exploration to students selected from schools affiliated through Brookhaven partnerships. Students spend one week during winter break to introduce them to the Laboratory's science.

Community Summer Science Program (CSSP)
Brookhaven conducts a Community Summer Science Program for high school students who are 16 and older and have completed Grade 10. This summer commuter program consists of scientific lectures and facility tours by BNL staff scientists and hands-on workshops in biology, physics, chemistry and environmental science.

High School Research Program (HSRP)
High school students 16 years or older participate in scientific research during the summer and academic year. Students are matched with a BNL mentor and every effort is made to align the project with the student's expressed interest.

Minority High School Apprenticeship Program (MHSAP)
This program offers laboratory experience and hands-on workshops to 9th grade underrepresented minority students who have demonstrated ability and/or potential in science-oriented studies and activities. The term offers five one-week segments of instruction in physics, biology, chemistry, meteorology, and environmental science.

Informal Education Internship (IEI)
In collaboration with the Dowling Center for Minority Teacher Development and Training, recent high school graduates and college pre-service teachers work with the BNL Science Learning Center staff to learn inquiry-based teaching skills supporting science curriculum.

Open Space Stewardship Program (OSSP)
The Open Space Stewardship Program fosters partnerships between schools, land stewards, local communities, and government agencies. The program is focused on enabling teachers and students to assist in managing our open space properties on Long Island through scientific research and related activities.

Office of Educational Programs

SUMMER 2008 INTERNSHIP PROGRAMS
GRADUATE SCHOOL FAIR, POSTER SESSIONS,
SYMPOSIUM, AND CLOSING CEREMONY

WEDNESDAY AUGUST 13, 2008

8:00 am to 9:00 am	Student registration & poster set-up	Berkner Hall–Lobby
9:00 am to 11:00 am	Panel Discussion: "*Graduate School Admission"*	Berkner Hall–Auditorium
11:00 am to 11:15 am	Break	
11:15 am to 1:15 pm	Student Poster Session	Berkner Hall–Lobby
1:15 pm to 2:00 pm	Lunch	Berkner Hall–Cafeteria
2:00 pm to 4:00 pm	Graduate School Fair	Berkner Hall–Room B
Concurrent: 10:00 am to 3:00 pm	H. S. Research Program Presentations	Office of Educational Programs Auditorium Building 438

BROOKHAVEN NATIONAL LABORATORY
Office of Educational Programs

SUMMER 2008 INTERNSHIP PROGRAMS
GRADUATE SCHOOL FAIR, POSTER SESSIONS,
SYMPOSIUM, AND CLOSING CEREMONY

THURSDAY AUGUST 14, 2008

8:00 am to 8:45 am	Registration and student poster set-up	Berkner Hall – Lobby
9:00 am to 11:45 am	Student Oral Presentations:	
	Environmental/Engineering/Other	Berkner Hall - Auditorium
	Chemistry	Chemistry, Bldg 555 – Auditorium
	Physics	Physics, Bldg 510 – Auditorium
	Medical/Biology	Medical, Bldg 490 – Large Conference Room
11:45 am to 12:30 pm	***Lunch***	***Berkner Hall***
12:30 pm to 1:45 pm	Student Poster Session	Berkner Hall - Lobby
2:00 pm to 4:00 pm	**Closing Ceremony**	**Berkner Hall - Auditorium**

Welcome and Introduction of staff by OEP Manager, Kenneth White
Video Presentation: *Summer Student's Experience*
Remarks by:
Laboratory Director, Samuel Aronson
DOE Site Manager, Michael Holland
U.S. Congressman, Timothy Bishop

Keynote Speaker: Dr. Jeff Pon, Chief Human Capital Officer, U.S. Department of Energy

Acknowledgement of participants in the following summer programs:
FaST – Faculty and Student Teams
DOE-ACTS – DOE Academies Creating Teacher Scientists
CCI – Community College Institute
PST – Pre-Service Teacher
GRIP – Graduate Research Internship Program
SULI – Science Undergraduate Laboratory Internship
HSRP – High School Research Program
CSSP – Community Summer Science Program
IEI – Informal Education Internship, Dowling-BNL Summer Programs
MHSAP – Minority High School Apprenticeship Program

4:00 pm ***Refreshments*** ***Berkner Hall – Lobby***

Dr. Jeff T. H. Pon
Chief Human Capital Officer

Dr. Jeff Pon is the U.S. Department of Energy's Chief Human Capital Officer (CHCO), a position to which he was appointed on January 9, 2006. As the Department's CHCO, Dr. Pon serves as the Secretary's principal advisor and policy maker on all matters relating to the design and execution of human capital strategy and is the senior DOE official accountable for acquiring and developing a high quality workforce within the Department.

Prior to assuming his current position, Dr. Pon served as the U.S. Office of Personnel Management's E-Government Deputy Director, leading the Government-wide effort to implement the five E-Government initiatives and the Human Resource Line of Business. OMB designated the Office of Personnel Management (OPM) as the managing partner for these efforts. These human resource information technology initiatives support the selection and development of human capital across Government. Additionally, they support a government worker's life cycle, including retirement and re-entry into the Federal workforce.

Dr. Pon has extensive experience in the human resources, information systems and developing organizational infrastructure responsible for delivering quality services and solutions to commercial and government clients. Most recently, Dr. Pon was Director of Brandsoft, a leader in software solutions for enterprise management, where he was responsible for developing business strategies and managing the delivery of professional services to major commercial clients. Prior to this, he was the Corporate Organizational Development Consultant at Seagate Technology, the largest hard-drive manufacturing business in the world, and largest public company to go from publicly offered, to privately held, back to publicly offered in a matter of 18 months. While there Dr. Pon helped develop and implement large-scale operations and financial systems integration. Dr. Pon was the head of human resources for a global company, company president of a technology organization and formed executive boards and also sat on several boards in the commercial sector.

He is a graduate of the University of Southern California with a Bachelor of Arts in Psychology and Human Factors, and the California School of Professional Psychology with a Masters of Science and Doctor of Philosophy in Industrial-Organizational Psychology. Dr. Pon and his family currently live in Ashburn, Virginia.

2008 Brookhaven National Laboratory
Student Oral Presentations and Abstracts

Presentation Agenda - Environmental/Engineering/Other - Berkner Hall, Auditorium

9:05-9:19 am

Marine Boundary Layer Cloud Properties as a Function of the El Nino/Southern Oscillation
ANDREA L FISCHER (Stony Brook University)
MICHAEL P. JENSEN (Brookhaven National Laboratory)
DAVID TROYAN (Brookhaven National Laboratory)

9:20-9:34 am

Catalytic Acceleration of Biodiesel Oxidation by Copper
CHRISTOPHER BROWN (Clarkson University)
KAITLIN THOMASSEN (SUNY Geneseo)
C. R. KRISHNA AND THOMAS BUTCHER (Brookhaven National Laboratory)

9:35-9:49 am

Formation and Dissociation of Methane Hydrates in Consolidated Sand: Duplicating Methane Hydrate Dynamics beneath Sea-floor
KRISTINE HORVAT (Stony Brook University)
PRASAD KERKAR (Brookhaven National Laboratory)
DEVINDER MAHAJAN (Brookhaven National Laboratory)

9:50 - 10:05 am **INTERMISSION**

10:06-10:19 am

Point Source Determination of Perflurocarbon Tracers (PFT)
RICHARD DEANE (Fort Berthold Community College)
XAVIER DRIVER (Fort Berthold Community College)
THOMAS ABE (Fort Berthold Community College)
JOHN HEISER (Brookhaven National Laboratory)

10:20-10:34 am

Design Of A 1 KW Proton Exchange Membrane (PEM) Fuel Cell With Dual Cooling Systems
MICHAEL ESPINOZA (Stony Brook University)
DEVINDER MAHAJAN (Brookhaven National Laboratory)
HAZEM TAWFIK (SUNY Farmingdale)

10:35-10:49 am

Determination of home range size and inter-specific competition for territory among red and gray foxes in an island ecosystem
RENEE FALLIER (Boston University)
JENNIFER HIGBIE (Brookhaven National Laboratory)

10:50-11:04 am

Develop high efficient thermoelectric material p-type Filled Skutterudite $CeFe_4Sb_{12}$
YE GU (SUNY Binghamton University)
QIANG LI (Brookhaven National Laboratory)

11:05-11:14 am

A Characterization of Endophytic Bacteria and Poplar Plant Interactions
NOAH BUNCHER (Evergreen State College)

11:15-11:29 am

The Effects of Physical and Chemical Water Quality Parameters on the Distribution of Aquatic Invertebrates within the Carmans River on Long Island, New York.
MELLISSA WINSLOW (Clarkson University, Potsdam)
GLEN BORNHOFT (SUNY Oneonta)
VICKY LYNN GIESE (California Polytechnic University)
DR. TIMOTHY GREEN (Brookhaven National Laboratory)

11:15-11:29 am

Fabrication of Monovalent Nanoparticles for Site-Specific attachment in Au-DNA Superlattices
ERICA PALMA (Stony Brook University)
OLEG GANG (Brookhaven National Laboratory)

Environmental/Engineering/Other Abstracts

Marine Boundary Layer Cloud Properties as a Function of the El Nino/Southern Oscillation.
ANDREA L FISCHER (Stony Brook University)
MICHAEL P. JENSEN (Brookhaven National Laboratory)
DAVID TROYAN (Brookhaven National Lab)

Marine boundary layer (MBL) clouds are low lying clouds that are often found along the eastern boundaries of the world's oceans. These cloud systems are important to the earth's climate due to their impact on the local radiation balance through reflection of a great deal of incoming shortwave radiation without a compensating change in longwave radiation. Despite their importance, these clouds are poorly represented in global climate models and, therefore, a better understanding of their properties is necessary. Through global teleconnections, the El Nino/Southern Oscillation (ENSO) cycle may influence weather and cloud systems throughout the world. This study investigates the correlations between the ENSO cycle and MBL cloud properties. By partitioning statistics of MBL cloud micro- and macro- physical properties using measures of the strength of the ENSO cycle, it is possible to suggest the impacts of the this cycle on MBL cloud systems around the entire globe. Seven years of MBL cloud properties observed by the Moderate Resolution Imaging Spectroradiometer (MODIS) onboard NASA's Terra and Aqua satellites, from five regions where MBL clouds are prominent (California, Peru, Canary, Angola and Australia) were partitioned using the Multivariate ENSO Index. By comparison of the distributions of the physical cloud properties of liquid water path, optical depth, effective radius and cloud diameter from these five regions it is evident that there exists a relationship between MBL cloud properties and the ENSO cycle for regions of Peru and the Canary Islands. California, Angola and Australia lacked consistent relationships with the cloud properties observed; therefore their relation to the ENSO cycle is inconclusive. Peru's microphysical properties appear to be influenced by the ENSO cycle. During the warm phase of the ENSO (El Nino) the liquid water path, effective radius, and optical depth measurements are generally greater than those during the cold phase (La Nina). Macro-physical properties of the Canary Islands appear to be impacted by the ENSO cycle; cloud diameter is larger during the warm phase of ENSO. Therefore, the relationships between MBL cloud properties and ENSO that vary from region to region may be due to differing amounts of atmospheric subsidence, ENSO related variability in the Hadley circulation or perhaps variability in upper level cloudiness. Since MBL clouds are significant to the earth's climate, investigating the influence of ENSO cycles on MBL cloud properties helps understand these clouds and their role in the global climate.

Catalytic Acceleration of Biodiesel Oxidation by Copper.
CHRISTOPHER BROWN (Clarkson University)
KAITLIN THOMASSEN ((State University of New York at Geneseo)
C. R. KRISHNA AND THOMAS BUTCHER (Brookhaven National Laboratory)
Fatty Acid Methyl Ester (FAME) made to American Society for Testing and Materials (ASTM) standard D6751 is a renewable fuel that when domestically produced, can decrease dependency on foreign energy while reducing harmful emissions including sulfur oxides, particulates and CO2. FAME, commonly known as biodiesel, is often associated with natural degradation and poor stability properties. With this speculative observation, the industry is concerned that copper fuel system components will catalytically effect biodiesel degradation. Based on this, the purpose of this study is to quantitatively evaluate the catalytic performance of copper fuel system components in the oxidation of biodiesel over time. It was hypothesized that with age, copper tubing used in the field will have significant coatings and deposits from previous fuel degradation. It is theorized that these deposits will limit the catalytic effects of copper on biodiesel through minimal surface area contact. In order to determine the catalytic effect of new copper on biodiesel, B100 was aged in tubing utilized by industry fuel systems. To age the fuel samples, a temperature controlled environment was utilized to thermally accelerate the fuel's effective exposure to the copper. The aged fuel was then analyzed through Fourier Transform Infrared (FTIR) spectroscopy, measuring the change in percent infrared (IR) absorption across the IR spectra. Through the oxidation process of biodiesel, peroxides are among the first components

to be produced. Based on IR absorption signatures that specific compounds produce, it is possible to correlate an increase in absorption of IR light at the wave number range of 3500cm -1 to the formation of peroxides. The relative quantity of peroxide formation is accounted by the total change in IR absorption. Through this technique, it is possible to determine the magnitude of oxidative degradation in biodiesel. The FTIR results have shown the catalytic performance of new copper in biodiesel is not measurable. New copper, in comparison to quartz and stainless steel, performed identically in the rate of peroxide formation. Because of the performance of new copper, it was not necessary to test the performance of aged copper. Along with showing no acceleration of peroxide formation through the presence of copper, these results have produced a broad mapping of the peroxide formation in biodiesel with respect to time. From this, it is conclusive that the overall catalytic performance of copper is low, and that copper component based fuel systems are biodiesel compatible.

Formation and Dissociation of Methane Hydrates in Consolidated Sand: Duplicating Methane Hydrate Dynamics beneath Sea-floor.
KRISTINE HORVAT (Stony Brook University,)
PRASAD KERKAR (Brookhaven National Laboratory)
DEVINDER MAHAJAN (Brookhaven National Laboratory)
Methane hydrates are inclusion compounds where water molecules form an icy cage to surround a methane molecule. They occur in permafrost and marine environments where high pressure and low temperature conditions coexist. Estimates of more methane in place in the form of hydrates throughout world than any other fossil fuel have sparked an interest in hydrates for a potential energy supply for decades. However, there has been growing evidence that methane hydrates play a crucial role in seafloor stability and global warming. To alleviate these problems, more must be understood about sediment-hydrate interaction during dissociation, so in this study, under the seafloor conditions have been duplicated in the Flexible Integrated Study of Hydrates (FISH) Unit to observe the pressure, temperature, and gas output responses upon methane hydrate formation and dissociation. The FISH Unit consists of a pressurized Temco cell filled with water saturated Ottawa sand maintained at a low temperature and high pressure. After charging methane gas, methane hydrate formation pressure-temperature (PT) kinetics is monitored with time until pore pressure asymptotes at hydrate equilibrium pressure. Dissociation is achieved through depressurization from equilibrium predictions in pure water and pure methane, and cooling due to the endothermic nature of hydrate dissociation is observed throughout the sample with thermocouples placed at different lateral and radial positions. During dissociation, temperature monitoring shows that the center radius of the cell drops in temperature more rapidly than the middle radius, thereby indicating that hydrates start to dissociate from the center of sample towards the walls. In addition, calculations using PT data collected shows that for the enthalpy of dissociation is found to be 59.45 kJ/mol, which confirms previously reported calculations of 56.43 kJ/mol. Also, post-depressurization PT equilibrium fit theoretical data for methane hydrates; therefore methane hydrates were indeed formed.

Point Source Determination of Perflurocarbon Tracers (PFT)
RICHARD DEANE (Fort Berthold Community College)
XAVIER DRIVER (Fort Berthold Community College)
THOMAS ABE (Fort Berthold Community College)
JOHN HEISER (Brookhaven National Laboratory)

The purpose of this experiment is to help determine confirm the accuracy of the source release point of an atmospheric substance which should, under proper meteorological conditions, follow a Gaussian dispersion pattern. In order to verify the model different Perflurocarbon Tracers (PFT), were dispersed at a constant rate under conditions which allowed for a Gaussian dispersion pattern to indicate the point source of released PFTs. The PFTs are manufactured substances that can be detected at concentrations of femtoliter/liter or parts per quadrillion 10^{-15} . Detection of the PFTs by Serial Analyzer Sampler (SAS) containing Capillary Absorbent Tracer Sample tubes, CATS were analyzed by chromatography using an electron capture detector. This test was designed to determine the approximate distance from the original release source point PFTs and adjacent PFT release points. . The applications of determining point source are many, such as the release of a pollutant gas and the detection of its source, the release of a toxic biological, radiological or a chemical agent, or the detection of PFT tagged person, animal, industrial substance or environmental entity. This actual field test will help to determine the source of release of gases or other substances that are released into the atmosphere originating at a single

source or indicate a release point at a distance different from that of the source. The release of these gases from a point source has applications to most substances released in the atmosphere. The field test consisted of placing SAS units, at various locations with CAT tubes loaded into them, downwind from the tracer release units. The six PFTs were released from the tracer release units from different locations adjacent to the point source. The CATs were analyzed by gas chromatography and the results were concentrations of the PFTs were compared to the Gaussian plume distribution expected pattern of concentration. The result of the test indicated the changing wind conditions did not allow for a Gaussian plume pattern to emerge since low wind currents and eddies resulted in the detection of PFTs by on one of the SAS.

Design Of A 1 KW Proton Exchange Membrane (PEM) Fuel Cell With Dual Cooling Systems
MICHAEL ESPINOZA (Stony Brook University)
DEVINDER MAHAJAN (Brookhaven National Laboratory)
HAZEM TAWFIK (SUNY Farmingdale)
As the price of oil and natural gas continues to increase, reaching levels that threaten our local and national economy, the need to seek alternative sources of energy has become necessary to reduce our dependence on foreign oil and enhance our homeland security. Across the United States and around the globe, growing recognition of hydrogen's potential as a fuel has increased hydrogen research, development, and demonstration activities. The theoretical efficiency of fuel cell is higher than the internal combustion engine that represents the main source of energy for today's transportation vehicles. In a Polymer Electrolyte Membrane (PEM) fuel cell, the power output is influenced by the humidity and temperature inside the power stack. The electrochemical reaction inside the power stack of a hydrogen PEM fuel cell produces electric and heat energy. In fact almost 50% of the power produced by the fuel cell is heat energy that could be reclaimed for a cogeneration process or otherwise will be dissipated in the environment. Therefore a cooling system must be designed as a part of the power stack in order for the fuel cell to function safely and not exceed 80^{O}C to maintain the Membrane Electrode Assembly (MEA) in a good working condition. Therefore, a number of MEA manufacturers were contacted to acquire the specifications and power density information of their membrane for comparison of prices and evaluation of performance. This will assist in the determination of the total number of bipolar plates and fuel cells required to produce one kW of electric energy and approximately similar amount of heat. In this project, various cooling systems have been designed, utilizing Inventor CAD software, to absorb this excess heat and maintain the fuel cell operating at a safe temperature level. Each design will be transferred seamlessly to Finite Element Analysis (FEA) software (Algor) to perform heat transfer and cooling analysis to determine the optimum cooling system and the whole power stack configuration. Dual air cooling systems using fins and conduits were decided to be the best method with minimal parasite power necessary to operate a cooling fan. Unlike liquid coolant that would require more parasite power from the fuel cell and produce lower efficiency. FEA analysis shows that the finned design is more efficient in cooling then with just the conduits. Appropriate air flow must be provided to the conduits in order to keep the stack under 80 degrees Celsius. The final stage of this project will encompass a complete design of the power stack that contains a suitable number of single fuel cells and integrated with the appropriate cooling system.

Determination of home range size and inter-specific competition for territory among red and gray foxes in an island ecosystem.
RENEE FALLIER (Boston University)
JENNIFER HIGBIE (Brookhaven National Laboratory)
Foxes play an important role in Long Island ecosystems as one of few remaining predatory animals in the area, yet little is known about their natural histories. Non-invasive genetic studies in 2006 and 2007 identified red fox (*Vulpes vulpes*) and gray fox (*Urocyon cinereoargenteus*) on the Brookhaven National Laboratory property. A study performed in Summer 2008 built upon this initial research by investigating the individual home ranges of red and gray foxes and studying the competition and territoriality between the species. Researchers attempted to trap and radio-collar up to six adult red and gray foxes to determine their home ranges through radio telemetry. One red fox kit was successfully collared, providing only one week of data before he could no longer be found. Additionally, scat was collected over an eight-week period with a focus on areas with scat that appeared to be marked by another fox. DNA contained in the scat was analyzed using mitochondrial DNA markers to determine if red and gray fox were marking the scat of the other species. Fecal DNA analysis indicated that at two locations, red and gray foxes marked each other's scat. This finding suggests that foxes at Brookhaven National Lab experience inter-

specific competition for territory. Trapping and radio collaring will resume next winter in an effort to remedy the trapping difficulties experienced in Summer 2008. This study is part of an ongoing fox population study at BNL in which researchers will continue to investigate the population dynamics and basic behaviors of red and gray foxes.

Develop high efficient thermoelectric material p-type Filled Skutterudite $CeFe_4Sb_{12}$
YE GU (SUNY Binghamton University)
QIANG LI (Brookhaven National Laboratory)

Thermoelectric (TE) devices based on thermoelectric materials can convert heat directly into electricity without hazardous emission or use electricity for cooling without chlorofluorocarbons (CFC). In order for a thermoelectric device to have high efficiency, both n-type and p-type thermoelectric materials with comparable high figure of merit ZT (a parameter characterizing the performance of thermoelectric materials) is needed. Filled skutterudite compounds have been proved to be promising new thermoelectric materials for waste heat recovery. Currently, ZT of n-type filled skutterudite has arrived 1.3 at about 800K while the highest ZT of p-type filled skutterudite is only about 1 at the same temperature. To enhance ZT of p-type filled skutterudite compounds, new synthesis technique which combined melt spinning and Spark Plasma Sintering (SPS) was used to produce p-type filled skutterudite $CeFe_4Sb_{12}$. The phase composition was confirmed using X-ray power diffraction. Transport property measurements were performed to get the electrical resistivity, thermal conductivity and Seebeck coefficient on a physical property measurement system (PPMS). Our new synthesis process produced filled skutterudite $CeFe_4Sb_{12}$ with superior thermoelectric properties. The electrical resistivity of our samples is much lower than that previously published, while the Seebeck coefficient and thermal conductivity values are comparable with previous data, which result in more than 20% enhancement of ZT value at room temperature. This study demonstrates that our new synthesis route is very promising in producing high efficient thermoelectric materials.

A characterization of endophytic bacteria and poplar plant interactions
NOAH BUNCHER (Evergreen State College)
ALISTAIR ROGERS (Brookhaven National Laboratory)

Producing biomass for energy that does not negatively impact food supply will require the establishment of biofuel species on poor quality soils that are not used for agriculture. The association of endophytic bacteria with their plant hosts has been shown to have a growth-promoting effect for many different plant species and suggests that plant-endophyte interactions may allow improved growth on marginal soils. However, few relationships between plants and these endophytes have been characterized and studied in detail. Previously the endophytic bacteria enterobacter 638 was shown to promote growth in *Populus trichocarpa* (poplar). We grew poplar cuttings in Hoagland's solution and investigated the impact of enterobacter on the N status of poplar. To account for possible differences in growth rate, we selected leaves for harvest and analysis using the leaf plastochron index (LPI). In the youngest leaves (LPI 2) nitrate levels were significantly and markedly (120%) higher in poplar inoculated with enterobacter suggesting that these plants were better able to take up nitrate. Free amino acid content and starch content was not altered by the presence of enterobacter but leaf protein content was reduced by c.10%. These data provide preliminary evidence that poplar inoculated with enterobacter may have an improved ability to acquire and assimilate nitrate, a trait that would be desirable for feedstock species suitable for growth on marginal soils.

The Effects of Physical and Chemical Water Quality Parameters on the Distribution of Aquatic Invertebrates within the Carmans River on Long Island, New York.
MELLISSA WINSLOW (Clarkson University)
GLEN BORNHOFT (SUNY Oneonta)
VICKY LYNN GIESE (California Polytechnic University)
DR. TIMOTHY GREEN (Brookhaven National Laboratory)

The Carmans River is one of a few pristine aquatic ecosystems on Long Island that provides habitats for a variety of different organisms. Roadside run-off, fertilizers, septic systems, and groundwater contaminants are inputs spurred from development that degrade the condition of aquatic ecosystems. These factors directly affect water quality and the distribution of aquatic invertebrates, which in turn affect higher trophic levels. Sensitive populations such as invertebrate species serve as indicators of biological integrity. This research is the initial investigation of a

longitudinal study, which will be used for planning mitigation projects. The physical and chemical variations in water quality were compared for six different locations and among three habitat types selected along the Carmans River. Water samples taken at each location were tested in areas of varying water velocities. A YSI 650 MDS water quality meter was used to measure the real-time data for temperature, pH, dissolved oxygen, conductivity, and turbidity. Water samples were analyzed using a HACH kit digital titrator and colorimeter. This analysis provides data for water hardness (total, magnesium, and calcium hardness), alkalinity, acidity, nitrate, nitrite, and ammonia levels. Using a Surber sampler, aquatic invertebrate samples were collected, preserved, and then sorted and identified using a compound light microscope and taxonomic keys. Rapid Bioassessment was another technique used to assess invertebrate diversity, which provided supplementary data needed to create a more accurate biodiversity index. By comparing the data collected from each site, an understanding of invertebrate diversity within the Carmans River can be established as well as correlates invertebrate distributions with environmental parameters. The Carmans River and the biodiversity that it supports has been identified as a key natural resource on Long Island by several groups including the U.S. Fish & Wildlife Service, the Environmental Defense Fund, the Nature Conservancy, and the New York State Department of Environmental Conservation. Studying water quality and correlating effects on aquatic invertebrate populations can assist in identifying problem areas. These areas can then be targeted for future projects to improve water condition.

Fabrication of Monovalent Nanoparticles for Site-Specific attachment in Au-DNA Superlattices.

ERICA PALMA (Stony Brook University)
OLEG GANG (Brookhaven National Laboratory).

Gold nanoparticles synthesized with DNA are building blocks with an unexplored molecular versatility that allows them to be considered for a range of applications within the fields of optics, medicine, and energy. Due to the programmable and functional nature of DNA, it is readily used as the mechanism for the self-assembly of nanoparticles into superlattices. The repeating unit cells that make up these structures can be manipulated through varying both the nanoparticle and the DNA. A key component of efficient synthesis involves being able to control the amount of DNA per nanoparticle that affects the local connectivity and the overall structural morphology of the aggregate due to changes in the bonding. In particular, monovalent (with one DNA) particles are desired for directed incorporation within the DNA-particle lattice. The goal was to develop a reliable method for the fabrication of monovalent particles, in this case 5nm gold particles, with controllable recognition properties for their site-specific attachment to DNA in the lattice. However, particles functionalized with only one thiolated DNA are unstable, so the particle surface needed to be coated with phosphane prior to adding the DNA in ratios ranging from 1:1 to 1:5. Overall, current efforts include development of methods for synthesis, purification and characterization using gel electrophoresis, UV-VIS Spectroscopy and dynamic light scattering (DLS). Gel electrophoresis allowed for the separation of bands based on the number of DNA attached to the particle. Placing the desired bands in dialysis tubes within an electric field allowed for the particles to be accessed in order to confirm the number of DNA using UV-VIS Spectroscopy and DLS. The success of this purification process is not yet known but we will be looking for which ratios are the best for producing monovalent particles along with the actual number on our particles. Based on the number of DNA we will be able to determine how effective our methods are and if monovalent particles are not produced we will still assemble them into the super lattice to see how they interact. Without results I am unable to draw conclusions that will state the next logical steps.

Chemistry - Building 555A, Hamilton Seminar Room

9:05-9:19 am

Uranium Extraction From Ores The Green Way
WILLIAM W. KWOK (Housatonic Community College)
CLEVELAND J. DODGE (Brookhaven National Laboratory)
AJ. FRANCIS (Brookhaven National Laboratory)

9:20-9:34 am

[^{18}F]Fluorobenzoquinone for Peptide and Protein Labeling
ELIZABETH J. MILLINGS (Suffolk County Community College)
JACOB M. HOOKER (Brookhaven National Laboratory)

9:35-9:49 am

Frequency Modulated Laser Absorption Spectroscopy of Singlet CH_2 in the Near Infrared Region.
JEREMY PIGEON (Bloomsburg University)
TIMOTHY BARVITSKIE (Bloomsburg University)
JU XIN (Bloomsburg University)
GREGORY E. HALL (Brookhaven National Laboratory)
TREVOR SEARS (Brookhaven National Laboratory)

9:50-10:04 am

***In situ* studies of CuO_x/CeO_2 catalyst during water-gas shift reaction using XRD and XANES.**
MICHAEL A. ESTRELLA (St. Francis College)
JOSE RODRIGUEZ (Brookhaven National Laboratory)
JONATHAN HANSON (Brookhaven National Laboratory)
WEN WEN (Brookhaven National Laboratory)
LAURA BARRIOS (Brookhaven National Laboratory)

10:05-10:14 **INTERMISSION**

10:15-10:29

Ni/NiO Core/Shell Nanoparticles for Information Storage Applications.
LAUREN KRENO (Cornell University)
STANISLAUS S. WONG (Brookhaven National Laboratory)

10:30-10:44 am

Attempts to minimize excess CO_2 in Earth's Atmosphere using Ruthenium Compound
MICKDY MILIEN (Kingsborough Community College)
MISBAH HOWARD (Kingsborough Community College)
VARATTUR REDDY (Kingsborough Community College)
DAVID GRILLS (Brookhaven National Laboratory)
DMITRY POLYANSKY (Brookhaven National Laboratory)

10:45-10:59 am

Analysis of the optimum conditions required to generate the most electricity from Microbial Fuel Cells
Kojo Wallace (CUNY – Bronx Community College)
Devicharan Chidambaram (Brookhaven National Laboratory)

11:00-11:14 am

Absolute Energy Finding Application for CH_2 in Java
ERIC B. FRIEDLANDER (Rice University)
GREG E. HALL TREVOR J. SEARS (Brookhaven National Laboratory)

11:15-11:29 am

Reactivity of Solvated and Presolvated "Dry" Electrons in the Ionic Liquid N-methyl N-butylpyrrolidinium is[(trifluoromethyl)sulfonyl]imide
CHARLENE LAWSON (Howard University)
JOCKQUIN JONES (Howard University)
SHAWN M. ABERNATHY (Howard University
JAMES F. WISHART (Brookhaven National Laboratory)

Chemistry Abstracts

Uranium Extraction From Ores The Green Way
WILLIAM W. KWOK (Housatonic Community College)
CLEVELAND J. DODGE (Brookhaven National Laboratory)
AJ. FRANCIS (Brookhaven National Laboratory)

Extraction of Uranium from naturally occurring ores is gaining renewed interest because of increase in demand for Uranium worldwide and recent increase in the cost of petroleum brand fuel. In this study we examined the use of Citric Acid which is cheaper and environmentally friendly method to extract Uranium from ores. In this process we will mix various concentrations of citric acid with the samples and allow Photodegradation to extract the pure Uranium. Photodegradation is the breakup of molecules by photons; in this case it will be the breakup of the whole citric acid complex. We used uranium ores obtained from Moab, Utah and Cigar Lake, Canada. The ore samples were ground to <0.2 mm and analyzed for uranium content using a Spectrophotometric method. Micro-XANES analyses at the National Synchrotron Light Source (NSLS) confirmed the uranium was present in hexavalent form in the Moab ore and tetravalent form in the Cigar Lake mineral. Elemental mapping will be done to determine the association of iron, manganese, calcium and other metals with the uranium. X-ray diffraction will be done at Stony Brook University to identify the mineral form. The results of this study will be useful for the optimum extraction from both low and high-grade ores. Extraction involving Nitric Acid, which is the old method, showed that 0.043% ± 0.008% of Moab Ore is Uranium. It also showed that 28.55% ± 2.35% of Cigar Lake Ore is Uranium.

[^{18}F]Fluorobenzoquinone for Peptide and Protein Labeling
ELIZABETH J. MILLINGS (Suffolk County Community College)
JACOB M. HOOKER (Brookhaven National Laboratory)

Fluorine-18 radiotracers for positron emission tomography (PET) have facilitated medical imaging studies of the brain and provided useful information about biochemical processes. Labeling and subsequent imaging of proteins and peptides can be particularly informative as they offer the ability to target specific cell and tissue types. The 109.7 min half-life of F-18 and the low concentrations at which radiochemical reactions are conducted preclude previously used synthetic methods. Moreover, these methods often require many steps and result in low yields. We set out to develop a simple and efficient way to incorporate F-18 into peptides and proteins using [^{18}F]fluorobenzoquinone (FBQ). The electrophilic nature of quinone functional groups makes them ideal “bridges” by which proteins and [^{18}F]fluoride, both nucleophiles, can be ligated. Envisioning a simple, one-step synthesis of [^{18}F]FBQ, we began by screening reactions of chlorobenzoquinone (CBQ) with [^{19}F]fluoride salts under various conditions. The optimal combination of cation, solvent, and temperature was determined by HPLC and TLC analysis. Reaction of CBQ with CsF in MeCN at 80 °C afforded FBQ in up to 40% yield. The major product of the reaction was coincident with an authentic sample of FBQ, which was prepared according to the literature and verified by ^{1}H, ^{19}F, and ^{13}C-NMR spectrometry. Initial attempts to incorporate [^{18}F]fluoride prior to reaction optimization were unsuccessful, however we expect the results to improve under these new conditions. Future work will focus on modeling the reaction of [^{18}F]FBQ with a thiol functional group to determine optimal conditions for protein and peptide labeling.

Frequency Modulated Laser Absorption Spectroscopy of Singlet CH_2 in the Near Infrared Region.
JEREMY PIGEON (Bloomsburg University)
TIMOTHY BARVITSKIE (Bloomsburg University)
JU XIN (Bloomsburg University)
GREGORY E. HALL (Brookhaven National Laboratory)
TREVOR SEARS (Brookhaven National Laboratory)

The free radical methylene (CH_2) is an intermediary in many combustion reactions and has been a topic of constant research for more than forty years. In order to better understand CH_2, the rovibronic energy levels are mapped out by spectroscopic analysis of the radical. To fill in some of the gaps of experimental spectra, data were taken in the near infrared, a region that was notoriously hard to probe in the past. This new spectrum was combined with older spectra recorded by the Gas-Phase Molecular Dynamics group at Brookhaven National Lab. The entire

data set was then analyzed in order to map out transitions in the rovibronic energy structure of the methylene radical. CH_2 was synthesized through the photolysis of ketene by 308 nm excimer laser. Next the radical was analyzed using a cw diode laser (EOSI 2010 Cavity with home-built diode module operating near 1.3μm) in the ranges 0.76 to 7.87 μm and 0.79 to 0.80 μm. Lines in the spectrum were analyzed by the calculation of combination differences within the data and by using known values for the ground state energies. Known energy transitions and new energy transitions were reevaluated and assigned based on the now more complete spectrum. These results are a small contribution to fully understanding the rovibronic energy structure of the methylene radical in order to properly model the combustion process.

***In situ* studies of CuO_x/CeO_2 catalyst during water-gas shift reaction using XRD and XANES**.

MICHAEL A. ESTRELLA (St. Francis College)
JOSE RODRIGUEZ (Brookhaven National Laboratory)
JONATHAN HANSON (Brookhaven National Laboratory)
WEN WEN (Brookhaven National Laboratory)
LAURA BARRIOS (Brookhaven National Laboratory)

Hydrogen is a potential alternative energy source to help us meet our ever-increasing energy needs. In this work, we studied the H_2 production from the water-gas shift (WGS) reaction over CuO_x/CeO_2 catalysts. Rather than relying on fossil fuels for the generation of H_2, which is the conventional method and thus further compounding the source of our current energy dilemma, we can generate H_2 cleanly by the WGS reaction: ($CO + H_2O \rightarrow CO_2 + H_2$). To help accelerate this reaction we use a heterogeneous catalyst, CuO_x/CeO_2. Our goal is to garner a fundamental understanding of the configuration and properties of our catalyst at its active sites during the WGS reaction so that we can enhance the design of future catalysts for better efficiency. *In situ* x-ray diffraction (XRD) experiments were carried out on beam line x7B and *in situ* x-ray absorption near edge spectroscopy (XANES) experiments were carried out on beam line x19A of the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratories. We used the XRD powder patterns from x7B and XANES from x19a to help characterize our catalyst and we also monitored the activity of the catalyst using gas chromatography-mass spectroscopy (GC-MS). In our set-up we have *in situ* synthesis of H_2 carried out in a flow cell with a 5% CO gas stream bubbled through H_2O. The cell, which contains our catalyst, is heated using a resistance coil as is the case at x7B or a hot air gun that was done at x19A, so that we may carry out our experiments isothermally. The gas outlet from the cell travels to the GC-MS that allows us to identify which gases are produced by both their retention time through a column and by their mass-to-charge ratio, respectively. The experiments at x7B produce results that are captured by a MAR345 image plate detector and at x19A we use a passivated implanted planar silicon (PIPS) detector to measure the fluorescence. Our XRD analysis reveals that at 25^{o}C we can clearly see Cu-O peaks yet as the temperature reaches 200^{o}C we see the onset of Cu-Cu peaks and a slight decrease of the Cu-O peaks. At about 300^{o}C we see the almost complete disappearance of the Cu-O peaks and the appearance of a very sharp Cu-Cu peak. This occurrence coincides with an increased production of H_2 and CO. At 400^{o}C there is only Cu metal present and the H_2 production is at its apex. The ceria follows the same pattern except that the oxidation state of ceria is reduced from +4 to +3. Our XANES data tells us the same story as our XRD data yet with more precision because we were able to observe the *in situ* runs at both the copper K-edge and the ceria L_{III}-edge. We were also able to readily oxidize and reduce our catalyst without compromise to its performance. Thus we see that Cu metal is vital for H_2 production and that the catalyst in its reduced phase is most efficient at dissociating H_2O. Another interesting facet is that the lattice parameters of copper do not change throughout the WGS reaction yet the ceria lattice varies. This may indicate that the copper is entering ceria vacancies leading to a $Cu_{1-x}Ce_xO$ catalyst, where the copper is doped in the ceria. This work is apart of a continuing study to understand the active sites for the WGS reaction on CuO_x/CeO_2 catalysts and demonstrates the advantage of *in situ* studies for heterogeneous catalytic reactions.

Chaperonin Protein Expression, and Purification, That Will Serve as a Versatile Platform, for Ordered Nanoparticle Arrays
THOMAS J. IPPOLITO (Villanova University)
MIRCEA COTLET (Brookhaven National Laboratory)

In an attempt to bring about a more efficient energy harvesting technology, as well as better and more functional bio-detection systems, we are using engineered chaperonin proteins originating from the hyperthermophilic archaeon *Sulfolobus shibatae* to pattern various types of nanoparticles, including semiconductor quantum dots and metal (gold) nanoparticles, in 2D arrays. S. shibatae chaperonins are donut-like shaped proteins, which self assemble from heat-shock proteins (HSP60) in the presence of ATP and Mg^{2+}. This particular protein is extremely stable in harsh conditions, including high temperature (up to 80°C), low pH (pH~2) and most importantly can tolerate genetic manipulations. Currently we are attempting to assemble genetic variants of the wild type chaperonin from S.shibatae, however the presence of misfolded subunits prevents crystal formation. Therefore we are currently exploring methods for purifying protein subunits with high yield (>90%), by setting up a state-of-the art protein expression and purification laboratory in the newly established Center for Functional Nanomaterials located at Brookhaven National Lab. The approach that is being taken at BNL is changing variables in the expression process, one at a time, and purifying small amounts of the protein with a fast protein liquid chromatography system. Such small amounts are then assembled in the presence of ATP and $MgCl_2$ and the assembled protein is checked with native PAGE gels. Once these gels show little or no presence of the unassembled subunits (misfolded protein subunits), we will assemble 2D crystals of these chaperonins, conjugate them with water soluble quantum dots and we will characterize them with STEM in the Biology Department. Our most current experimental data still shows the existence of misfolded protein in our samples, even after purification by a nickel column so we have decided to try and purify our samples using the same method a second time around hoping to remove the remaining misfolded proteins. (The rest of the results and conclusion to follow).

Ni/NiO Core/Shell Nanoparticles for Information Storage Applications
LAUREN KRENO (Cornell University)
STANISLAUS S. WONG (Brookhaven National Laboratory)

In the quest for sophisticated magnetic materials, core/shell nanoparticles present a compact medium for data storage. Specifically, an antiferromagnetic metal oxide shell covering a ferromagnetic metallic core traps some of the core's magnetic spins at the metal-metal oxide interface, creating a detectable magnetic signal. To explore this system, monodisperse transition metal nanoparticles were synthesized using a modified polyol process. Subsequently, the particles were subjected to various oxidation treatments to induce the growth of metal oxide on the surface of the particles. Evaluation of the oxidation products showed that heat treatment in air yielded the most control over particle oxidation. The temperature of the heat treatment was then varied to regulate the oxidation of the particles, which, along with particle size and morphology, was monitored using powder X-ray diffraction and transmission electron microscopy. Analysis of the particles using a superconducting quantum interference device revealed that the extent of oxidation affects the particles' magnetization and the magnitude of the observed exchange bias. By producing monodisperse metal nanoparticles and establishing a protocol to control their oxidation, it was possible to tune the magnetic properties of the particles.

Attempts to minimize excess CO_2 in Earth's Atmosphere using Ruthenium Compound
MICKDY MILIEN (Kingsborough Community College)
MISBAH HOWARD (Kingsborough Community College)
VARATTUR REDDY (Kingsborough Community College)
DAVID GRILLS (Brookhaven National Laboratory)
DMITRY POLYANSKY (Brookhaven National Laboratory)
Acetylation and deacetylation of histone protein by histone deacetylase (HDAC) affects transcriptional regulation and contributes to the development of cancer. HDAC's have emerged as attractive targets in anticancer drug development therefore the development of radiotracers for Positron Emission Tomography (PET) imaging of HDAC may provide tools for understanding the role played by these enzymes in a number of health related conditions. We therefore aim to synthesize two ^{11}C- labeled HDAC ligands (one a hydroxamic acid and the other an α-ketoamide) for PET imaging studies using baboons. Additionally we aim to prepare and study, using PET, the

in vivo biodistribution of ^{18}F-fluoroacetate (a possible metabolite of FAHA, another potential HDAC radiotracer). The preparation of the unlabelled target ligands and precursor compounds was undertaken using multi-step synthetic procedures. Conditions for the synthesis of the radiotracers together with high performance liquid chromatography (HPLC) conditions for their purification will be developed and baboon studies attempted. The target unlabelled hydroxamic acid was successfully prepared in a four step process using commercially available reagents, while the synthesis of its corresponding precursor molecule by demethylation of the target compound using boron tribromide failed to yield the desired precursor molecule. Alternative procedures for the synthesis of the precursor compound for the hydroxamic acid ligand are currently being developed. Preparation of the α-ketoamide and its precursor by an eleven step process has proven to be more challenging and is still currently in progress. ^{18}F-Fluoroacetate has been successfully prepared using kryptofix, potassium carbonate and the corresponding precursor molecule in acetonitrile at 100˚C for five minutes. Conditions for the purification of fluoroacetate have been optimized and baboon studies are to be conducted. The results of these studies may provide valuable information on the distribution and activity of HDACs in diseased and normal states and therefore allow better understanding of the relationship between genes, brain chemistry and enzymatic behavior.

Analysis of the optimum conditions required to generate the most electricity from Microbial Fuel Cells

KOJO WALLACE (CUNY – Bronx Community College)
DEVICHARAN CHIDAMBARAM (Brookhaven National Laboratory)

Global warming and other problems associated with greenhouse gases have led to tremendous interest in researching environmentally friendly fuels. Biofuels, which have received the most attention so far, also have their associated problems, such as their effect on the cost of foodstuffs such as corn. The problems associated with the production of fuel have prompted the study of the production of electricity by bacterial using cost effective materials such as glucose and wastewater. This research addresses this issue by investigating the electricity producing ability of the bacteria *Shewanella Oneidensis* which oxidizes food sources such as glucose, sodium acetate and sodium lactate, in the process generating electrons which can be harvested as electricity. The research was conducted with electrical cells made up of two glass bottles with a proton exchange membrane (PEM) attached between them. The PEM served as the point of exchange of protons generated by the oxidizing action of the bacteria on the food source. The two cells were then connected with electrical wires attached to carbon paper electrodes. This setup was connected to a resistance block and a meter, to record the electrical potential produced by the cell; which was used to calculate the current generated by the bacteria. This research is still in progress and analysis of the resistance at which the cells produce the maximum current, as well as the optimum conditions for the best results will be carried out. Further research will also be conducted on soil and water samples taken from a lake to possibly discover other bacteria capable of producing electricity by oxidizing food sources more efficiently.

Absolute Energy Finding Application for CH_2 in Java
ERIC B. FRIEDLANDER (Rice University)
GREG E. HALL TREVOR J. SEARS (Brookhaven National Laboratory)

When a molecule is excited to an elevated state it can only be excited from one of several lower states given by a set of selection rules that are specific to the given molecule. These selection rules arise from quantum mechanics and the fact that almost everything (spin, shape, etc.) of a molecule is quantized. When the spectrum of the molecule is taken, the differences in energy of the set of lower energy levels that transition to a given excited states will correspond to the differences in energy between peaks on the spectrum. Therefore, the proper peaks can be located using these differences. Once the peaks for a given excited state are located the absolute energy of the excited state can be calculated by adding the energy of the lower state with the transition energy given by the wavelength of the peak on the spectrum. Using java, a program was implemented that uses the selection rules to calculate the set of lower energy levels and from that the energy differences. It then scans the spectrum for these differences. Once it finds the set of the peaks that lead to the excited energy state it calculates that state's energy by adding the lower energies to the transition energies given by the peaks. It was possible to scan the extensive spectrum of radical methylene and calculate the energies of the excited energies. This information will, hopefully, lead to more knowledge dealing with the behavior of radical intermediates in combustion-like reactions.

Reactivity of Solvated and Presolvated "Dry" Electrons in the Ionic Liquid N-methyl N-butylpyrrolidinium bis[(trifluoromethyl)sulfonyl]imide.
CHARLENE LAWSON (Howard University)
JOCKQUIN JONES (Howard University)
SHAWN M. ABERNATHY (Howard University)
JAMES F. WISHART (Brookhaven National Laboratory)

Ionic liquids (ILs) are defined as salts with melting points below 100ºC. Because of their diverse properties, ILs have attracted widespread attention as promising alternatives to conventional (i.e. molecular) organic solvents. ILs are comprised entirely of cations and anions--typically a heterocyclic nitrogen-containing cation and an inorganic anion. They are non-volatile, non-flammable, and exhibit high conductivity, which makes them attractive solvents for implementation in the Green Chemistry movement and improved chemical transformations. In order to fully evaluate their potential in new applications, it is imperative to study and understand their reaction kinetics using ionizing radiation. For this investigation, we will use electron pulse radiolysis to study the reactivity in the ionic liquid *N*-methyl *N*-butylpyrrolidinium bis[(trifluoromethyl)sulfonyl]imide ($P_{14}NTf_2$) with selenate, cadmium, nitrate, and benzophenone scavengers. Using the Brookhaven National Laboratory (BNL) Laser-Electron Accelerator Facility (LEAF), we will be able to directly observe the behavior of transient species on a pico- and nanosecond timescale. Results are pending.

Presentation Agenda – Physics – Building 510, Auditorium

9:05-9:21 am — **Amelioration of Contact Resistivity $La_{2-\delta}Sr_{\delta}CuO_4$ Thin-Films**.
BRIAN C. COOPER (Temple University)
VLADIMIR BUTKO AND IVAN BOZOVIC (Brookhaven National Laboratory).

9:22-9:37 am — **Developing a Graphical User Interface for the PARCS Reactor Core Simulator** **JOSHUA D. STEINBERG** (Bucknell University)
PETER KOHUT (Brookhaven National Laboratory)

9:38-9:53 am — **Tailoring Better Absorbing Active Material Blends for Organic Photovoltaics**.
STEVEN MON (Columbia University)
RALUCA GEARBA, RON PINDAK, AND C. T. BLACK (Center for Functional Nanomaterials and National Synchrotron Light Source, Brookhaven National Laboratory).

9:54-10:09 am — **Modal Calculations, and harmonic observations of the carbon fiber mounting for the National Synchrotron Light Source II Beam Position Monitor (BPM).**
Zaid Aziz (Rensallaer Polytechnic Institute)
Sushil Sharma (Brookhaven National Laboratory)

10:10-10:25 am — **INTERMISSION**

10:25-10:40 am — **Failure of Photomultiplier Tubes Under Hydrostatic Pressure**
Ian Andrews (University of Chicago)
Mary Bishai (Brookhaven National Laboratory)

10:41-10:56 am — **Design of a Monochromator with Kinematical Motion for the National Synchrotron Light Source X-7A Beamline.**
M. Walker, V. Collins, E. Shaban (Southern University Baton Rouge)
D. P. Siddons(Brookhaven National Laboratory)

10:57-11:12 am — **Upgrade of the Differential Algebra Module of the Unified Accelerator Libraries**. **YISHU HUANG** (Columbia University)
NIKOLAY MALITSKY (Brookhaven National Laboratory)

Physics Abstracts

Amelioration of Contact Resistivity $La_{2-\delta}Sr_{\delta}CuO_4$ Thin-Films
BRIAN C. COOPER (Temple University)
VLADIMIR BUTKO AND IVAN BOZOVIC (Brookhaven National Laboratory).

We have been experimenting with different oxygen annealing conditions in an effort to significantly the reduce contact resistance in our gold patterned $La_{2-\delta}Sr_{\delta}CuO_4$ (LSCO) thin films. Attempts to perform Hall and combinatorial measurements of $La_{2-\delta}Sr_{\delta}CuO_4$ (LSCO) thin films have been hindered due to the fact that contact resistance is of the same order of magnitude as the film's resistance (or greater), and this is causing a major problem for accurate Hall and Combinatorial measurements of the samples. We have had to resort to depositing a few mono-layers of over doped LSCO ($0.3 \leq \delta \leq 0.4$) on the surface of the films to abate this contact resistivity issue. Although the high electron carrier density of the over doped LSCO disrupts the creation of a dead layer between gold and optimally doped LSCO ($\delta \approx 0.15$) it is a time consuming and inefficient process to carry on indefinitely. We are currently investigating the effects of annealing evaporated in situ and ex situ deposited copper/gold contacts on sample surface to promote diffusion into the samples. The initial results are quite promising. We have a reduction of 3 orders of magnitude in the measured contact resistance in 2 samples, but we are currently in the stage of verifying the reproducibility of our procedure.

Developing a Graphical User Interface for the PARCS Reactor Core Simulator
JOSHUA D. STEINBERG (Bucknell University)
PETER KOHUT (Brookhaven National Laboratory

The Purdue Advanced Reactor Core Simulator (PARCS) predicts the power distribution in nuclear reactor cores when they are subject to changes such as the movement of control rods or changes in coolant conditions. The inputs of the program are located in a text file that needs to be completed in order to successfully achieve a working model. Some of the inputs include the core type, core power, initial boron concentration, cross-section information, fuel assembly locations, and print options. Currently, the process is long and tedious in order to adjust the inputs for each of the successive simulations. A graphical user interface (GUI) is being developed to make the input of the PARCS system easier to handle for the user. Prior to this research and development, there had been no GUI for these inputs. The platform that was chosen to develop the GUI upon was JAVA as it is a programming language that is platform independent and free. A tabbed window was created, with one tab corresponding to each input section, to make the layout of the GUI compact and practical. The inputs questions within each section (tab) are answered using true/false type buttons and text fields. The inputs are sent to a file to be read in by PARCS. Although the GUI is operational, there is room for further work. The code is quite long and could be made more easily readable. In addition, it would be useful to have a graphical representation of the reactor core on some of the tabs. This is particularly evident in the geometry input section and doing so would make the GUI more user-friendly. It is evident that this GUI will speed up the process of modeling the power distribution in nuclear reactor cores.

Tailoring Better Absorbing Active Material Blends for Organic Photovoltaics.
STEVEN MON (Columbia University)
RALUCA GEARBA, RON PINDAK, AND C. T. BLACK (Center for Functional Nanomaterials and National Synchrotron Light Source, Brookhaven National Laboratory).

More effective use of solar energy is an essential component of any long-term strategy for addressing growing global energy concerns. Solar cells based on organic semiconductor materials are an attractive alternative to conventional inorganic photovoltaics in that they are potentially easier to fabricate at lower cost. Unfortunately, organic photovoltaic devices (OPV) have low light-to-electricity conversion efficiencies of slightly over 5% - too low to provide cost-competitive electricity. Material factors that limit OPVs efficiencies are: insufficient absorption in the broad spectrum of solar light; poor conversion of excitations (excitons) to electrical charge; and poor electrical conductivity. Our research goals are to understand these limiting factors and develop more efficient solar cells by, for example, improving active layer absorption or choosing materials with better electrical charge mobility. We first fabricated OPV devices from a 1:1 mixture

solution of poly(3-hexyl) thiophene (P3HT), a p-type semiconductor, and a fullerene derivative, [6,6]-phenyl-C_{61}-butyric acid methyl ester (PCBM), an n-type semiconductor. The blend material absorbs light at wavelengths between 400-650nm, and has an absorption length (α^{-1}) of 320nm at wavelength 480nm. Our best devices yielded conversion efficiencies of 4.3%. We investigated whether small thiol molecules added to the P3HT:PCBM blend change the material absorption. Adding 2.4% 1,8 dithiol molecules red-shifts the peak absorption by 40nm to 520nm, which is useful as the incident solar spectrum has a higher intensity at longer-wavelength light. There is also a decrease in α^{-1} at longer wavelengths specifically a 44% decrease in α^{-1} at 600nm incident wavelength. This reduction is important since it allows the absorption of more photons with significantly thinner film. We are presently exploring new OPV devices based on blends of pentacene (p-type) and a perylene derivative (n-type). The potential advantage is that both materials can absorb light, whereas in P3HT:PCBM absorption occurs mainly in P3HT. Pentacene also has at least ~100x better charge mobility than P3HT. We measured light absorption by the pentacene:perylene blend between 400-600nm (similar to P3HT:PCBM), however the absorption depth is significantly smaller - α^{-1}=57nm at λ=545nm. The peak absorption wavelength (545nm) is red-shifted by 65nm compared to that of P3HT:PCBM (480nm) and by 25nm compared to P3HT:PCBM with1,8dithiol. We are presently understanding the impact of changes in material absorption on OPV light-to-electricity conversion efficiency.

Modal Calculations, and harmonic observations of the carbon fiber mounting for the National Synchrotron Light Source II Beam Position Monitor (BPM).
ZAID AZIZ (Rensselaer Polytechnic Institute)
SUSHIL SHARMA (Brookhaven National Laboratory)

This paper is an analysis of the vibratory response of the proposed carbon fiber mountings for the National Synchrotron Light Source II (NSLS II) Beam Position Monitoring Devices. In order to achieve maximum brightness of the NSLS II electron beam, a limit has been placed on the RMS orbit shift to 10% of the RMS beam size. This corresponds to a RMS vertical and horizontal beam orbit displacement of 0.5μm and 19.4μm respectively. To maintain this constraint on random electron beam motion, Two x-ray beam position monitors will be placed at each front end as part of an active feedback system. This feedback system will detect and correct for both angular and displacement steering errors of the x-ray beam. The x-ray Beam Position Monitors(BPM's) have stringent mechanical stability tolerances, any mechanical instability will interfere with the BPM's ability to take accurate error measurements. The RMS vertical and horizontal displacement of the x-ray BPM's are specified to be less than 0.1 μm and 1μm, respectively. To attain these strict RMS displacement tolerances carbon fiber mountings have been proposed due to their low coefficient of thermal expansion, since tunnel air temperatures will be kept within ±0.1°C, the 1 meter carbon fiber support stand will deform vertically ±0.02 μm, which is within the specified tolerances for vertical displacement. In transverse, or width, direction Carbon fiber composites are softer than their steel or aluminum counterparts typical Young's moduli in the transverse direction are between 120 GPa and 7.5 GPa, this corresponds to a low natural frequency around 50 Hz meaning vertical displacement around 0.1 μm. In order to insure that the carbon composite beam does not displace outside the horizontal tolerances of the BPM. We calculate the transverse elastic modulus through beam deflection tests, and then the behavior of the beam in boundary conditions which simulate how the beam will be placed on the NSLS- II beam line. These test will Insure that the carbon composite beam will be a viable component for mounting the X-ray beam position monitoring devices.

Failure of Photomultiplier Tubes Under Hydrostatic Pressure
IAN ANDREWS (University of Chicago)
MARY BISHAI (Brookhaven National Laboratory)

For neutrino detection experiments such as the Daya Bay θ_{13} project, it is often necessary to suspend spherical arrays of photomultiplier tubes (PMT's) in scintillating liquids such as water or liquid argon. The implosion of these PMT's under hydrostatic pressure presents the need for a better understanding of their behavior when submerged so that costly accidents can be prevented.A statistical model for the structural failure of Hamamatsu R7081/NG PMT's is being developed which seeks to determine the factors controlling a particular tube's peak survivable hydrostatic pressure, in addition to the correlation between pressure shockwaves at the time of implosion and the potential for mechanical initiation of implosion of adjacent PMT's.

Research began with the creation of an experimental database of PMT pressure tests and cycles since March 2007, followed by a secondary database analyzing the variations in glass thickness in each of the tested tubes. The analysis showed that thickness in various regions of the PMT glass had a negligible effect on maximum hydrostatic pressure, as did structural defects such as glass flaws.
The pressure pulse data generated by each tube's failure were first matched against corresponding CCD camera data. This showed us that the vast majority of the pulse information was corrupted by reflection within the pressure vessel, meaning that only the initial pulse could be used for analysis. Data from each initial pulse were then fit into a normal distribution to determine what factors were common among all of the PMT's. Analysis of each pulse's rise time and shape showed that in all of the R7081 tests, the plastic base of the tube breached the crown immediately after implosion. Consequently, the structure of the PMT glass itself has very little to do with the implosion of the tube, and that the integrity of the base (the determining factor in the peak pressure) varies by almost as 200% in some of our results.
The basis for our current model is the Tillotson equation of state, which describes the behavior of metallic elements in hypervelocity scenarios such as rapid implosion; future studies might attempt to create a model based on an alternative equation, use pre-written fluid dynamics simulation software, or simply create similar models for other PMT's. Our model for R7081/NG failure is expected to provide a reasonably accurate reflection of PMT implosion, and could be used as an alternative to testing PMT's.

Design of a Monochromator with Kinematical Motion for the National Synchrotron Light Source X-7ABeamline.
M. WALKER (Southern University Baton Rouge)
V. COLLINS (Southern University Baton Rouge)
ELHAQ SHABAN (Southern University Baton Rouge)
D. PETER SIDDONS (Brookhaven National Laboratory)

A monochromator acts as an adjustable diffraction device, allowing the regulation of wavelengths of radiation, that is beneficial because it enables the selection specific parts of an electromagnetic spectrum. We constructed a double multilayer monochromator, in which one multilayer is inverted vertically with a clearance of 7.5mm between the surfaces of the multilayer. The multilayer is a synthetic structure having the properties of a crystal in one dimension, allowing it to select one x-ray wavelength from a continuous input spectrum. The first multilayer directs the radiation onto the next, providing a horizontal monochromatic beam to probe one sample. Following a simple design process, and instituting some kinematical design properties in the manufacturing of the proposed project, we fabricated a double silicon monochromator that uses an one and one-half inch clearance for a mounting rail so that it would not contact the motors in the vicinity. This allows adjusting of the distance between the centers of the multilayers to approximately 40 cm. The motors alter the vertical diffraction angles in conjunction with a spring, oriented inside a triangle formed with the motors and screws, which produces a constant constriction between the motors and the plate that holds the silicon. In order to restrict horizontal motion of the multilayers we placed a cone, and a trench oriented perpendicular and parallel to the point of the cone under the surface where the silicon is placed, so that the horizontal motion is restricted. The finished product complies with all of the design constraints, as well as being optimized for weight, space, and efficiency; it will be installed, tested, and operated at X-7A, National Synchrotron Light Source, Brookhaven National Lab.

Upgrade of the Differential Algebra Module of the Unified Accelerator Libraries.
YISHU HUAN(Columbia University)
NIKOLAY MALITSKY (Brookhaven National Laboratory)

The Unified Accelerator Libraries (UAL) represent an object-oriented software environment that can manage the complexity of accelerators and provide models for a variety of accelerator tasks. This project specifically addresses the Differential Algebra (DA) package of the UAL. DA is one of the most important techniques used in computational accelerator physics. It provides Taylor maps for various optical elements, and allows one to study the nonlinear behavior of particles in accelerator systems. This technique has been applied to several special magnets, such as the helical dipole of the Relativistic Heavy Ion Collider (RHIC), the wiggler of the CESR storage ring, and the combined function magnet used in the deuteron Electric Dipole Moment (dEDM) lattice.

In the past, this approach was implemented in the Perl programming language, with an external subroutine (XS) interface to call C++ subroutines. The use of Perl as a user interface allowed for modularity of the UAL, providing flexibility in combining different libraries to model complex scenarios. However, the use of composite applications through an XS interface created difficulties in testing and debugging. Furthermore, the discovery of a design solution for implementing a user-oriented interface has made Perl's flexibility unnecessary in implementing the DA technique. This project aims to consolidate and enhance the previous applications in a new DA module based on the C++ programming language to eliminate the need for an XS interface while maintaining and improving upon the modularity of previous UAL modules. In addition to enabling more effective debugging, reimplementation in C++ also has the advantage of compatibility with a highly useful software toolkit called ROOT, which aids in high-energy physics analysis.

Presentation Agenda – Biology/Medical – Building 490, Large Conference Room

9:05-9:19 am

A Computational Process to Locate IS Elements and Study Horizontal Gene Transfer in Bacterial Genomes.
WALTER LEWIS (Cheyney University of Pennsylvania)
SEAN MCCORKLE (Brookhaven National Laboratory)
SEBASTIEN MONCHY (Brookhaven National Laboratory)

9:20-9:34 am

Analysis of p53 Binding Site in Human Genome After Radiation Exposure Using *Saccharomyces cerevisiae* as a Model System
SAMSAD PAVEL (Stony Brook University)
KRASSIMIRA BOTCHEVA (Brookhaven National Laboratory)
CARL W. ANDERSON (Brookhaven National Laboratory)

9:35-9:49 am

Crystal Structure Analysis Of A Putative Oxidoreductase From *Klebsiella pneumoniae*
MOHAMMAD M. BAIG (Medgar Evers College)
CHARLYN A. THOMAS (Medgar Evers College**)**
ANN C. BROWN (Medgar Evers College)
S. ESWARAMOORTHY (Brookhaven National Laboratory)
S. SWAMINATHAN (Brookhaven National Laboratory)

9:50-10:04 am

K-means Clustering to Extract the Arterial Input Function in PET Imaging.
MATTHEW G. SABATELLO (St. Joseph's College)
JEAN LOGAN (Brookhaven National Laboratory)
DAVID ALEXOFF (Brookhaven National Laboratory)

10:05-10:14 am

Impaired learning in high-functioning cocaine-addicted individuals is associated with memory deficits
CATHERINE L. URBAN (SUNY Geneseo)
PATRICIA A. WOICIK (Brookhaven National Laboratory)
RITA Z. GOLSTEIN (Brookhaven National Laboratory)

10:15-10:29 am **INTERMISSION**

10:30-10:44 am

Characterization of Peripheral Glucose Metabolism in Mice with Reduced Expression of the Dopamine Transporter: Differential Modulation by Gender and Insulin Status
WENDY LUI (Stony Brook University)
PANAYOTIS K. THANOS (Brookhaven National Laboratory)

10:45-10:59 am

Effect of the mutation at Gln115 on the Human Adenovirus Proteinase with its Substrate Binding
JING GAO (Univeristy of California)
WALTER F. MANGEL (Brookhaven National Laboratory)

11:00-11:14 am

Effect of Isoflurane on Lactate and Other Metabolites in the Neocortex of Rats Investigated by ^{1}HMRS
DONG WOO CHIN (Stony Brook University)
HELENE BENVENISTE (Brookhaven National Laboratory)

11:15-11:29 am

Binding of synthetic growth factor to heparin: Optimization of the release rate of fluorescein labeled peptides.
DEENA GHOUL (Stony Brook University)
M. ZULEMA CABAIL (Brookhaven National Laboratory)
LOUIS PEÑA (Brookhaven National Laboratory)

11:30-11:44 am

Microbeam Radiation Therapy to Treat the 9LGS Rat Brain Tumor
LYNDA NWABUOBI (Stony Brook University)
MARK SALOMON (University of Michigan)
STEPHAN WARREN (Tallahassee College)
NICOLLE LANIER (Suffolk Community College)
AVRAHAM DILMANIAN (Brookhaven National Laboratory)

Medical/Biology Abstracts

A Computational Process to Locate IS Elements and Study Horizontal Gene Transfer in Bacterial Genomes.
WALTER LEWIS (Cheyney University of Pennsylvania)
SEAN MCCORKLE (Brookhaven National Laboratory)
SEBASTIEN MONCHY (Brookhaven National Laboratory)

Currently there is a tremendous focus on studying how whole units of DNA are shared between species. These movable tracks of DNA, called transposons, are demarcated by shorter insertion sequence (IS) elements. These IS elements generally around 700 to 2500 bp in length, and code for proteins implicated in the transposition activity called transposase. IS elements are bracketed by pairs of inverted repeats of variant length (approx. 10 -30 bp), and are further embedded in a pair of short direct repeats of approximately 3 – 7 bp. While there is a great deal of software to automatically annotate genes and regulatory regions, there is currently only one known program to identify IS elements *de novo.* Hundreds of completed bacterial genomes are currently available and more are constantly being added to that list, which makes it increasingly important for the computational detection of IS elements. To this end, we have developed a Java program to locate IS elements in bacterial genomes. The program consists of three major components. The first is a compilation of known transposase genes. This data is then used to search the interiors of the inverted repeat sequences which are found by the program *de novo.* The program then reports the positions of the repeats and the length of the putitave IS element. Preliminary tests on the genome of *Enterobacter* strain 638, recently sequenced as part of the DOE biofuels initiative, revealed 9 putative IS candidates, 6 of which were confirmed by Blastx searches of Genbank, which yielded strong homology matches to transposase and intergrase in other organisms. Further testing on an IS-rich genome, now *Cupriavidus metallidurans* (CH34), will allow us to optimize program parameters to improve performance. Because this process reports direct and inverted sequence pairs, which travel along with the IS element as it moves, it can be used to trace horizontal gene transfer history within or between genomes for evolutionary studies.

Analysis of p53 Binding Site in Human Genome After Radiation Exposure Using *Saccharomyces cerevisiae* as a Model System
SAMSAD PAVEL (Stony Brook University)
KRASSIMIRA BOTCHEVA (Brookhaven National Laboratory)
CARL W. ANDERSON (Brookhaven National Laboratory)

The p53 protein is a tetrameric transcription factor (TF) that acts as a tumor suppressor in mammalian cells. This protein controls cell cycle arrest, senescence, DNA repair, apoptosis, and other key components of cell development by regulating the gene expressions upon induced genotoxic or non-genotoxic stresses. The binding of p53 to its specific response elements (RE) in the vicinity of a gene can either activate or repress the expression of that gene. This investigation sets to isolate specific p53 binding sites from human cells after radiation exposure. Locating and understanding these p53 target sites in human genome can be used to identify genes that might be important for regulating cancer development with possible clinical significance. This approach combined Chromatin Immunoprecipitation (ChIP) with the yeast-based screen for transcriptional activation. ChIP was used for isolating and purifying DNA fragments specifically bound by p53. A Library of such sequences was screened in *S. cerevisiae* to identify those able to confer transcriptional activation. Out of approximately 3 x 10^5 transformants screened, 39 were found to be able to direct transcriptional activation in a p53-dependant manner. The ChIP fragments from these transformants were sequenced and mapped in human genome. Some of these identified genes are found in oncogene pathways. This experiment is part of a broader project that seeks to analyze the p53 signaling response in human cells triggered by DNA damaging agents.

Crystal Structure Analysis Of A Putative Oxidoreductase From *Klebsiella pneumoniae*
MOHAMMAD M. BAIG (Medgar Evers College)
CHARLYN A. THOMAS (Medgar Evers College**)**
ANN C. BROWN (Medgar Evers College)
S. ESWARAMOORTHY (Brookhaven National Laboratory)
S. SWAMINATHAN (Brookhaven National Laboratory)

Crystal structure is essential to understand the shape and the functional mechanism of a protein molecule. This fundamental knowledge of a protein will be used to understand its malfunction or disease and eventually for treatments. Protein Structure Initiative (PSI) is a NIH sponsored project to determine crystal structure of every protein families. As part of PSI, crystal structure of an oxidoreductase from *Agrobacterium tumefaciens* has been determined. *A. tumefaciens*, a rod-shaped gram-negative soil bacterium, is the casual agent of Crown Gall disease (the formation of tumors) in over 140 species of dicot. Crown Gall disease causes tumors in plants such as grape vines, stone fruits, nut trees, sugar beets, horse radish and rhubarb. This causes great concern for the agricultural industry. This protein (target ID 11128a1BCt5p1), was originally obtained from the New York Structural Genomix Research Consortium (NYSGXRC). Crystals of the enzyme were obtained with PEG MME 2000, ammonium sulfate and sodium acetate trihydrate pH 4.6. These crystals were used to collect X-ray data at beam line X12C of the National Synchrotron Light Source (NSLS, BNL). The data have been used to determine the structure using the SHELX and the refinement was performed with CNS 1.1. This protein has an alpha/beta structure and forms a dimer with beta sheets forming the interface. This enzyme is involved in the catalysis of an oxidation-reduction (redox) reaction. It utilizes NADP and NAD to perform its function. The crystal structure had no bound cofactor. The active site and functional mechanism of the protein have to be analyzed by other biochemical experiments as well. By knowing the structure of this protein, attempts can be made by pharmaceuticals to limit its pathology in the agricultural industry.

K-means Clustering to Extract the Arterial Input Function in PET Imaging
MATTHEW G. SABATELLO (St. Joseph's College)
JEAN LOGAN (Brookhaven National Laboratory)
DAVID ALEXOFF (Brookhaven National Laboratory)

PET (Positron Emission Tomography) is a medical imaging tool used to measure radioactivity in the human body after the injection of a radio-labeled tracer, which leads to the creation of a quantitative image that is used to compare results between subjects. In this study, the K-means clustering algorithm, which was written in C by our research group, is used to extract the input function (radioactivity in the blood) from the early time frames of the PET study. Normally this is done by sampling arterial blood, which is invasive. This algorithm creates groups of Time Activity Curves (TAC) by examining each voxel (3D pixel) from the PET image and assigning it to a cluster. This procedure is being tested using several tracers, including ^{11}C methamphetamine. The Imaged Defined Input Function (IDIF), which is the output of the k-means clustering algorithm, is compared to measured arterial plasma radioactivity from the same studies. Before we can use this algorithm, there must be some adjustments made to the image, such as rotating the image to a certain orientation and creating a Region of Interest (ROI) around the carotid arteries. The final step will be to develop a procedure to estimate the recovery coefficient in order to compensate for the fact that the radioactivity of the carotids in the image underestimates the true radioactivity (partial volume effect). The implementation of this algorithm would eliminate the need for test subjects to have a catheter inserted into their artery during a PET scan.

Impaired learning in high-functioning cocaine-addicted individuals is associated with memory deficits
CATHERINE L. URBAN (SUNY Geneseo)
PATRICIA A. WOICIK (Brookhaven National Laboratory)
RITA Z. GOLSTEIN (Brookhaven National Laboratory)

One feature of drug addiction is the persistent use of the drug despite harmful consequences. Such compulsive behavior may be associated with cognitive deficits, particularly in memory and executive function, previously observed in cocaine abusers. Here we (1) compare high-functioning cocaine abusers (substance dependent individuals=SDI) to healthy control subjects

(NML) on performance on a classical neuropsychological executive function task, the Wisconsin Card Sorting Task (WCST), (2) use all WCST repetitions to perform an in-depth examination of the group differences in learning, and (3) evaluate how selected cognitive and motivational factors may contribute to perseverative errors on this task. Sixty-two NML and 62 gender, age, and education-matched SDI completed a computerized version of the WCST. The sample was divided into two groups: those who could not complete all WCST repetitions (SDI, *n*=29; NML, *n*=16) vs. those who could (SDI, *n*=33; NML, *n*=46). To decrease the impact on results of factors associated with low education and socio-economic status, the non-completers were excluded from further analyses. Participants also completed a learning and memory test, the California Verbal Learning Test (CVLT), and a state measure of self-reported motivation. Results showed that there were no differences in perseverative errors between the high-functioning SDI and NML groups. However, NML showed decreased number of perseverative errors as a function of repetition (F=4.9, p>.05), while SDI did not (F=4.9, p>.05). Further, while decreased motivation in the task predicted perseverative errors in NML (β=.46, p<.01), memory capacity (learning curve on the CVLT) predicted perseverative errors in SDI (β=-.48, p<.01). Our results indicate that compared to healthy control subjects, demographically well-matched (and high-functioning) cocaine abusers show compromised learning on the WCST. The correlation with CVLT suggests that this WCST performance deficit may be associated with a learning and memory impairment that possibly depends on functioning of selected temporal and prefrontal cortical brain regions. Taken together, these findings suggest that an inefficient encoding of information into long-term memory, and not decreased motivation, in part drives perseverative behavior in cocaine abusers. Enhancing this cognitive function (e.g., by cognitive-behavioral exercises) may contribute to decreasing harmful persistent behaviors in addiction (e.g., excessive drug use).

Characterization of Peripheral Glucose Metabolism in Mice with Reduced Expression of the Dopamine Transporter: Differential Modulation by Gender and Insulin Status
WENDY LUI (Stony Brook University)
PANAYOTIS K. **THANOS** (Brookhaven National Laboratory)

Background: The Dopamine Transporter (DAT) regulates synaptic DA concentrations through its reuptake action of DA. Previous studies have documented decreases in AMPH-induced DA release and AMPH self-administration in rats rendered hypoinsulinemic after administration of Streptozotocin (STZ), a potent antibiotic that selectively targets and damages insulin-releasing pancreatic beta-cells (Ruggero Galicia, 2003) (Owens WA, 2005). Interestingly, insulin replacement therapy reverses the behavioral effects of AMPH in STZ treated rats (Sevack RJ et al 2007). Furthermore, hypoinsulinemic rats show reduced cell surface expression of DAT (Williams JM, 2007). Finally, using microPET imaging with 2-[18F]-fluoro-2-deoxy-D-glucose (FDG), mice lacking DAT had significantly higher brain glucose metabolism compared to wild-type mice (Thanos et al. 2008). These studies suggest that both peripheral and central insulin and glucose metabolism may be involved in the regulation of DA and expression DAT. In this study, we hypothesized that because insulin is shown to diminish DAT expression, mice with reduced DAT expression, and hence increased synaptic DA levels, may differ in glucose metabolism from controls. *Methods:* We investigated peripheral glucose metabolism in male and female DAT wild-type (+/+), heterozygous (+/-) and knockout (-/-) mice before and after peripheral insulin-depletion (220 mg/kg STZ) and subsequent insulin replacement therapy. Peripheral measures of glucose metabolism consisted of plasma concentrations of glucose in response to a 2 g/kg glucose tolerance test (GTT). *Results:* The most notable finding was in the male DAT +/- whose glucose levels did not peak during the GTT, while DAT +/+ mice peaked and then gradually declined. On the other hand, we found that STZ-treated DAT +/- mice showed similar glucose levels compared to wild-type animals. Female DAT +/- mice also showed significantly lower glucose levels compared to control mice and unlike the males, this difference was not reversed by STZ. DAT knockout mice data will be presented at the meeting. *Conclusions:* Mice with reduced expression of DAT show significant differences from controls in glucose levels following a GTT and the direction of the difference was dependent upon gender. Insulin-depletion following STZ treatment reversed these differences in male but not female mice. These findings point to both DAT and gender-related modulation of glucose metabolism. Such findings will aid in advancing our understanding of DAT regulation of metabolism which may contribute to disrupted dopaminergic signaling in disease states such as addiction.

Effect of the mutation at Gln115 on the Human Adenovirus Proteinase with its Substrate Binding

JING GAO (University of California)
WALTER F. MANGEL (Brookhaven National Laboratory)

The human adenovirus proteinase (AVP) is an essential enzyme in the virus that processes precursor proteins to activate the viral particles. Previous study has revealed the crystal structure of both the active form and non-active form of wild type AVP. The crystal structure places Gln115 near the oxyanion hole which suggests the nitrogen on Gln115 might be responsible for orientate the peptide bond in the right position for cleavage. This study investigates the function of Gln115 through mutagenesis to reveal the mechanism of AVP-substrate interaction and its effect on enzyme activity. QuickChange Mutagenesis is used to change the 115th amino acid residue on AVP from a Glutamin to an Alanine. Mutant AVP is verified to be present in soluble form by gel analysis, and purified protein is then used in Rhodmine activity assay. The mutant AVP has significantly lower activity compare to wild type. The mutant has no apparent activity by itself but shows minor activity in the present of pVIc, an important cofactor for AVP. The reaction rate is further increased with the addition of DNA, another cofactor discovered from previous study. In addition, activity assay with different concentrations of pVIc is performed, and increasing reaction rate with increasing pVIc is observed. This suggests the mutant has altered kcat instead of km which suggests the absent of Gln115 lowers the catalytic ability of the enzyme instead of substrate binding. This result confirms the prediction of Gln115 being at the oxyanion hole. Further study is to crystallize the mutant protein and its complex with substrate to determine if the reduction in activity is due to folding error and to give more detailed picture of the interaction between Gln115 and substrate. Since the mutation result in deactivation of the viral proteinase, the Gln115 site is a possible target for anti-viral drugs.

Effect of Isoflurane on Lactate and Other Metabolites in the Neocortex of Rats Investigated by ^{1}HMRS

DONG WOO CHIN (Stony Brook University)
HELENE BENVENISTE (Brookhaven National Laboratory)

Isoflurane (ISO), a popular anesthetic gas, is used on laboratory animals to perform experiments humanely. ISO safely provides relaxation, hypnosis, analgesia and amnesia all at once, and it can be regulated so that the animals can wake up quickly after a given procedure. However, data interpretation may be inconsistent as indicated by proton magnetic resonance spectroscopy (^{1}HMRS) studies with monkeys showing that ISO can lead to concentration-dependent changes in a wide variety of metabolites in the brain. Our experiment tested ISO's influence on concentrations of metabolites in the neocortex of rats in comparison to Nembutal, an intravenous anesthetic. Using a 9.4T MRI instrument, ^{1}HMRS scans were performed in the neocortex of each rat. Group 1 rats were exposed to ISO, and Group 2 rats were exposed to Nembutal. Two scans were obtained from each Group 1 rat; one scan was done at 1 minimal alveolar concentration (MAC), and the other was at 2 MAC of ISO. In Group 2 rats, only one scan was performed at 40mg/kg of Nembutal. All physiological parameters of the rats were kept normal before and during each scan. Conventional software (LC Model) was used to analyze the ^{1}HMRS data. We found a significant increase in the lactate/Cr ratio in the neocortex at 2MAC compared to 1MAC of ISO. This direct relationship supports the idea that ISO causes an increase in the brain tissue lactate concentration. The lactate/Cr ratio in Nembutal-anesthetized animals was negligible in comparison to the lactate levels at either MAC of ISO. Importantly, the chemical shifts for lactate and neural stem cells (NSC) are very close to each other (1.33ppm vs 1.28ppm), and a high lactate peak in the ^{1}HMRS spectra can blunt the weak NSC signal. Hence, inaccurate data can be obtained if ISO is used as an anesthetic for the animals in NSC research. This comparison suggests NSC researchers should choose Nembutal over ISO to use for their experiments. In further investigations, we will examine the effects of other anesthetic gases and intravenous anesthetics on brain lactate to enhance our understanding of the differences in anesthetic gases and intravenous anesthetics.

Binding of synthetic growth factor to heparin: Optimization of the release rate of luorescein labeled peptides

DEENA GHOUL (Stony Brook University)
M. ZULEMA CABAIL (Brookhaven National Laboratory)
LOUIS PEÑA (Brookhaven National Laboratory)

Heparin-binding growth factors such as basic fibroblast growth factor (bFGF, a.k.a. FGF-2), and platelet-derived growth factor (PDGF), are important in the wound healing process. Heparin is a glycosaminoglycan that binds growth factors such as bFGF and PDGF. F2A4 is a synthetic growth factor, developed at BNL that mimics bFGF. F2A4 is a multi-domain synthetic peptide consisting of two long chains that bind to FGF receptors, a spacer domain, and finally a heparin-binding domain (HBD). The ultimate goal of this project is to design a loco-regional delivery of this bioactive peptide, which will act as a drug-delivery system. This will be done by creating a bioactive surface from a heparin+F2A4 coating that will accelerate the healing of wounded tissue. Because of its structure, F2A4, like FGF, binds to heparin. In order to test and modify the heparin-binding properties of F2A4, we used a series of similar peptides consisting of the HBD sequence, plus variation in the number and position of basic amino acid residues, including TAT and RAP21-(1Y), to act as surrogates for the much larger F2A4 product. From previous experiments, we know the dissociation constant of F2A4 and heparin. This makes it possible to test: (1) the kinetics of the release of F2A4 from a heparin-coated surface, and (2) the effect of modifying the sequence of the peptide. The bioactive coating was made by putting down silyl-heparin on a black 96-well polystyrene plate and then adding a peptide, tagged with fluorescein, containing an HBD sequence resuspended in an aqueous physiological buffer. We then measured the fluorescence intensity of the wells with a Tecan Ultra Evolution 384 fluorimeter, which showed how much fluorescein was in the wells. This gives us an idea of how well the F2A4 bound to the heparin. This product is distributed at different dilutions to find an appropriate concentration for the release kinetics measurement. We applied this method to the peptides with the HDB sequence and the heparin itself as well. Alternatively, to determine whether using a different type of heparin would promote a significant difference in the rate of release of the device, we used an avidin-coated plate, which has a high binding affinity for biotin. In this case, we coated the plate with biotinylated heparin instead of silyl-heparin. Substituting these materials did not prove significantly more or less effective than using the polystyrene plate.

Microbeam Radiation Therapy to Treat the 9LGS Rat Brain Tumor

LYNDA NWABUOBI (Stony Brook University)
MARK SALOMON (University of Michigan)
STEPHAN WARREN (Tallahassee College)
NICOLLE LANIER (Suffolk Community College)
AVRAHAM DILMANIAN (Brookhaven National Laboratory)

Synchrotron sources generate very intense beams of nearly parallel x rays. We make arrays of parallel microplanar beams (microbeams) from these beams and use them in microbeam radiation therapy (MRT). It has been shown that the normal brain tolerates irradiation with microbeams at much higher doses than conventional beams. Although there is a transient damage to the normal tissues positioned in the direct paths of the microbeams, they seem to recover from this damage better than the cancerous tissues, thus, preventing the risk of long-term normal tissue damage. This recovery is attributed to the fact that the normal capillary blood vessel cells that survive between the microbeams help repair the damage done in the neighboring microvasculature. Therefore, the goal should be to use a microbeam radiation method that can saturate the tumor with a complete beam while the segmented beams pass through the tissue with less effect. This is exactly what interlaced microbeams do. We have shown that two arrays of microplanar beams aimed at the tumor from 90° angles can be interlaced to produce a solid beam at the target. Rats were anesthetized with ketamine/xylaxine and injected with 9L gliosarcoma (9LGS) cells in the left side of the brain. The rats were irradiated using the interlaced beam method at day 13 after inoculation and weighed and observed daily following the radiation. Observations were based on whether or not the rats were sluggish, showed strange behavior (for example, squeaking), had any blood around their eyes or nose, or showed any signs of hair loss. Rats that showed signs of infection were injected with Baytril antibiotic. Now, two weeks after irradiation, most of the rats are gaining weight and show no sign of disease. Due to the time limit to this summer research, results and conclusions cannot be presented as of yet.

2008 BNL Student Poster Presentations

2008 Science Undergraduate Laboratory Internship Program (SULI)

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Andrews, Ian	Mary Bishai	Failure of Photomultiplier Tubes Under Hydrostatic Pressure	University of Chicago	4
Aziz, Zaid	Sushil Sharma	Modal Calculations, and harmonic observations of the carbon fiber mounting for the National Synchrotron Light Source II Beam Position Monitor (BPM).	Rensselaer Polytechnic Institute	6
Bae, Veronica	Fritz Henn	Comparison of Astrocyte Density in the Prefrontal Cortex and Hippocampus of Helpless and Nonhelpless Rats in the Model of Depression.	Queens College	7
Bagnienski, Steven	James Wishart	Dependence of physical properties on alkyl and ether chain length with phosphate ionic liquids.	Rutgers University	8
Beck, Jonathan	Ted D'Ottavio	Development of Data Collection and Display Programs for the Collider-Accelerator Controls Group	SUNY Binghamton	13
Bornhoft, Glen	Timothy Green	The Effects of Physical and Chemical Water Quality Parameters on the Distribution of Aquatic Invertebrates within the Carman's River on Long Island, New York	SUNY Oneonta	17
Boucher, John	Alan Raphael	The Physics of an Arc Flash	Middlebury College	18
Brown, Christopher	C. R. Krishna	Catalytic Acceleration of Biodiesel Oxidation by Copper	Clarkson University	19
Brown, Margaret	Robert McGraw	Principal Components Analysis of Aerosol Mass Spectra.	Stony Brook University	21
Buenten, Dane	Val Titus	Distribution of the Iridovirus in Eastern Box Turtles at Brookhaven National Lab	SUNY Fredonia	23
Bunch, Tyra	Timothy Green	Distribution Assessment of the New York State Threatened Banded Sunfish (*Enneacanthus obesus*) Conducted in Zeke's Pond, the Peconic River, and the Long Island Pine Barrens.	So. University at New Orleans	24

2008 Science Undergraduate Laboratory Internship (SULI) Program

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Caccavano, Adam	Craig Woody	Scintillation Light Yield Due to Highly Ionizing Particles in CF4 Gas	University of Oregon	27
Chin, Dong Woo	Helene Benveniste	Effect of Isoflurane on Lactate and Other Metabolites in the Neocortex of Rats	Stony Brook University	28
Chiu, Nicole	Robert Selvey	Beryllium Use Review Project	Stony Brook University	29
Chodnicka, Patrycja	Dev Chidambaram	Vanadium reduction by clostridium	Brooklyn College	30
Chuc, Mary	Robert Selvey	Beryllium Use Review Project.	Stony Brook University	31
Cleavenger, Grant	Jinsuo Nie	Models for Aging-Related Degradation of Structures and Passive Components in Nuclear Power Plants (NPP)	Elizabeth City State University	32
Collins, Shanika	Joanna Fowler	The Radiosynthesis of Ligands for the Positron Emission Tomography Imaging of Histone Deacetylases	Medgar Evers College	33
Cooper, Brian	Vladimir Butko	Amelioration of Contact Resistivity $La_{2-\delta}Sr_{\delta}CuO_4$ Thin-Films.	Temple University	35
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2008 Science Undergraduate Laboratory Internship (SULI) Program

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2008 Faculty and Student Teams (FaST) Program

2008 Faculty and Student Teams (FaST) Program

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Barvitskie, Timothy	Trevor Sears	Frequency Modulated Laser Absorption Spectroscopy of Singlet CH_2 in the Near Infrared Region	Bloomsburg University of Pa.	12
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2008 Faculty and Student Teams (FaST) Program

Student Name	Mentor	Research Title	University/College	Poster#
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Milien, Mickdy	David C. Grills	Hydrogenation of CO2	Kingsborough CC	67
Pigeon, Jeremy	Trevor Sears	Frequency Modulated Laser Absorption Spectroscopy of Singlet CH_2 in the Near Infrared Region	Bloomsburg University of Pa.	104
Rankin, Bethany	Devinder Mahajan	Catalyzed Conversion of Methanol into Higher Oxygenates	Tougaloo College	62
Smith, Nyesha	Timothy Green	Microbial Community Analysis: Long Island Pine Barren Forest Soils, NY	So. University at New Orleans	3
Thomas, Charlyn	S. Swaminathan	Crystal Structure Analysis Of An Oxidoreductase From *Agrobacterium tumefaciens*	Medgar Evers College	9
Walker, Marcus	David Siddons	Design of a Monochromator with Kinematical Motion for the National Synchrotron Light Source X-7A Beamline	So. University at Baton Rouge	34

Participating Professors

Dr. Ju Xin	Bloomsburg University	Dr. George Armstrong	Tougaloo College
Dr. Hazem Tawfik	Farmingdale State University	Dr. Ann Brown	Medger Evers College
Dr. Shawn Abernathy	Howard University	Dr. Elhag Shaban	Southern University Baton Rouge
Dr. Varattur Reddy	Kingsborough CC	Professor Thomas Abe	Fort Berthold CC
Dr. Sharon Lall-Ramnarine	Queensborough CC	Dr. Ray O'Neal	Florida A & M University
Dr. Murty Kambhampati	Southern University New Orleans	Dr. Stephen Egarievwe	Fisk University

2008 Community College Institute (CCI) Program

2008 Community College Institute (CCI) Program

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Ramdihal, Trisha	A. J. Francis	The biodegradation of ionic liquids	Queensborough Community College	107
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2008 Pre-Service Teacher (PST) Program

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Elizabeth Leupp – Master Teacher

2008 DOE Academies Creating Teacher Scientists (DOE-ACTS)

2008 DOE Academies Creating Teacher Scientists (DOE-ACTS)

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Pohlot, Catherine	Jeff Fitts	Determination of nano-Palladium Retention in Shallow Long Island Soils	Mt. Sinai High School	87
Sinacore, Joseph	Helio Takai	Measuring g Using a Magnetic Pendulum and Telephone Pickup	Newfield High School	93
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Vaccariello, Michael	John Dunn/Tim Green	PCR-Based Analysis of Tick-Borne Pathogens in *Amblyomma* and *Ixodes*	Sachem High School East	122

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2008 Graduate Research Internship Program (GRIP)

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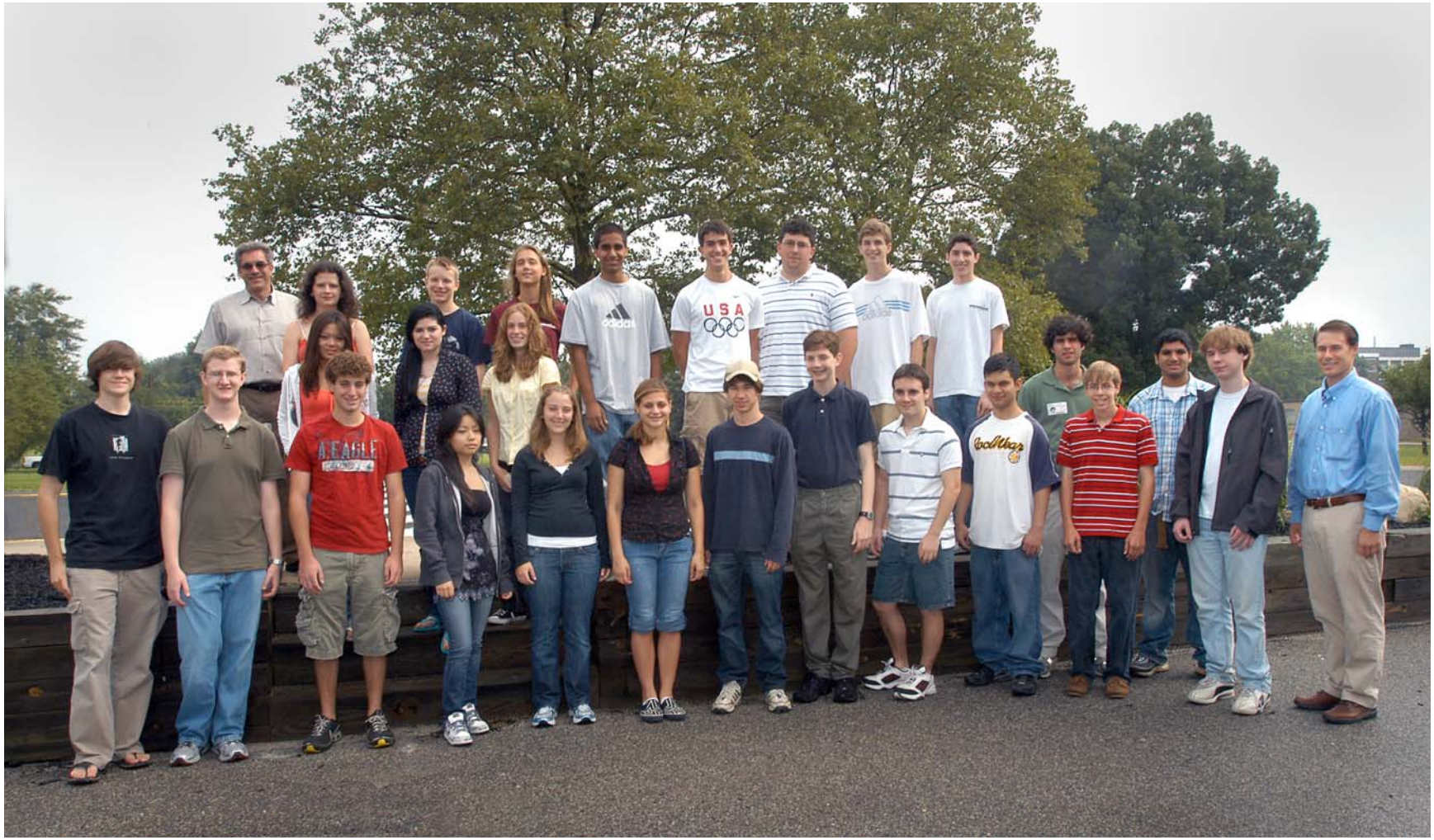
2008 High School Research Program (HSRP)



2008 High School Research Program (HSRP)

Student Name	Advisor	Research Title	High School
Claudia Gelfond	John Miller	Electron Transfer in Oliguofluorenes	The Dalton School
Andrew Cohen	Thomas Butcher	Preliminary Studies of Ethyl Levulinate: A Non Food-Source Biofuel	Columbia Preparatory School
Seth Fichtelberg	Scott Bronson and William Sherman	2-D DNA Array Synthesis via Rolling PCR	Kings Park
Michael Gurr	Mickey Chiu	Study of Muon Piston Calorimeter (MPC) Readout with CosmicRays and LED Pulses	Half Hollow Hills West
Stephanie Zitvogel	Val Titus	Presence of the *Iridovirus* in Eastern Box Turtles of Brookhaven National Laboratory	Babylon
Yulia Malitskaia	Richard Casella	Help Desk Ticket Generation Via Email Filters	Shoreham-Wading River
Matthew Sucher	Jeremy Feinberg	Investigating Vector-Mediated Transmission of a Chytrid Fungus from Mosquitoes to Frogs	Calhoun
Adam Rhoades-Brown	Daniella Schultz	Corticosterone Levels in Learned Helplessness: Comparison of Strain and Gender	Ward Melville
Emil Fine	Ivan Kotov	New Improvements: Projector Modifications for PSF Studies	Ward Melville
David Lawrence	Peter Takacs	Calibrating the Large Synoptic Survey Telescope CCD Array	Comsewogue
Jessica Michaels, Ravi Budhan, and Jose Castillo	Tim Green and John Dunn	PCR Based Analysis of Tick Born Pathogens in Amblyomma and Ixodes	Sachem East
Brett Morris	James Frank	Testing Candidate CCDs for the LSST: PSF Laser Spot Size Studies	Half Hollow Hills East
Haldun Matlu	William Morse	The Study of Neutrino Interactions in a Large Liquid Argon Detector Deep Underground at DUSEL	Kings Park
Stephen Lane	Alistair Rogers	Protein and Ureide Measurement in Soybeans of 2050	Harborfields
Kaitlin Eng	Congwu Du	The Effects of Cocaine, Methylphenidate and Lidocaine on the Brain Intracellular Calcium Imaging using a Fluorescent Microscope	High School of American College

2008 High School Research Program (HSRP)

Student Name	Advisor	Research Title	High School
Rubing Pan	Anat Biegon	The Effects of Cocaine, Methylphenidate and Lidocaine on the Brain Intracellular Calcium Imaging using a Fluorescent Microscope	Ward Melville
Daniel Cadel	Zhangbu Xu	Noise Rate Testing for Time of Flight (TOF) Detector in STAR	Elwood John H. Glenn High School
Deep Vansh Chopra	Daniel van der Lelie	Bioprospecting for Corn Stover Degrading Microorganisms	Syosset
Adam Lamson	Yannis Semertzidis	Optimization of the Spin Coherence Time of a Deuteron EDM in a Charged Particle Storage Ring	Shoreham-Wading River
Pelle Hall	Sean McCorkle	Bioinformatics with Perl	Shoreham-Wading River
Peter LeDeoux	Craig Thorn	Seeing Solar Neutrinos	Shoreham-Wading River
Dan Schiraldi	Yannis Semertzidis	Optimization of the Spin Coherence Time of a Deuteron EDM in a Charged Particle Storage Ring	Half Hollow Hills East
Marie Sweet	Paul Freimuth	Study of the Lytic Gene in Adenovirus	Shoreham-Wading River
Chao Xu	Aleksey Bolotnikov	Characterization of CdZnTe and CdMnTe Solid-State Radiation Detectors	Shoreham-Wading River
Mathew Steski	Dmitiry Polyanskiy	Automated Instrument Control Using LabView(R) for Transient Laser Spectroscopy	Shoreham-Wading River

2008 Community Summer Science Program (CSSP)

Beverly Agtuca - Sachem HS East
Andrew Baez - Northport HS
Eboni Bailey – Central Islip HS
Catherine Bautista - St. Anthony's HS
Jonathan Chen – Jericho HS
Jessica Cheung – Syosset HS
Irene Feretti – The Stony Brook School
Allan Gutierrez – Riverhead HS
Peter Kenigsberg - Half Hollow Hills HS East
John Kirkland – Shoreham/Wading River HS
Michelle Lee – General McArthur HS
Stephanie Lennon – Hauppauge
Katie Li – Ward Melville HS
Norah Liang – Patchogue-Medford HS
Rodolfo Nazitto – Connetquot HS
Thomas Pandolfo – Hampton Bays HS
Minti Patel – Rutgers Preparatory
Brittany Roncone – Riverhead HS
Eitan Stant – East Islip HS
Jessica Stellmann – Hampton Bays HS
Daniel Stoll – Patchogue-Medford HS
Amanda Zambito – William Floyd HS

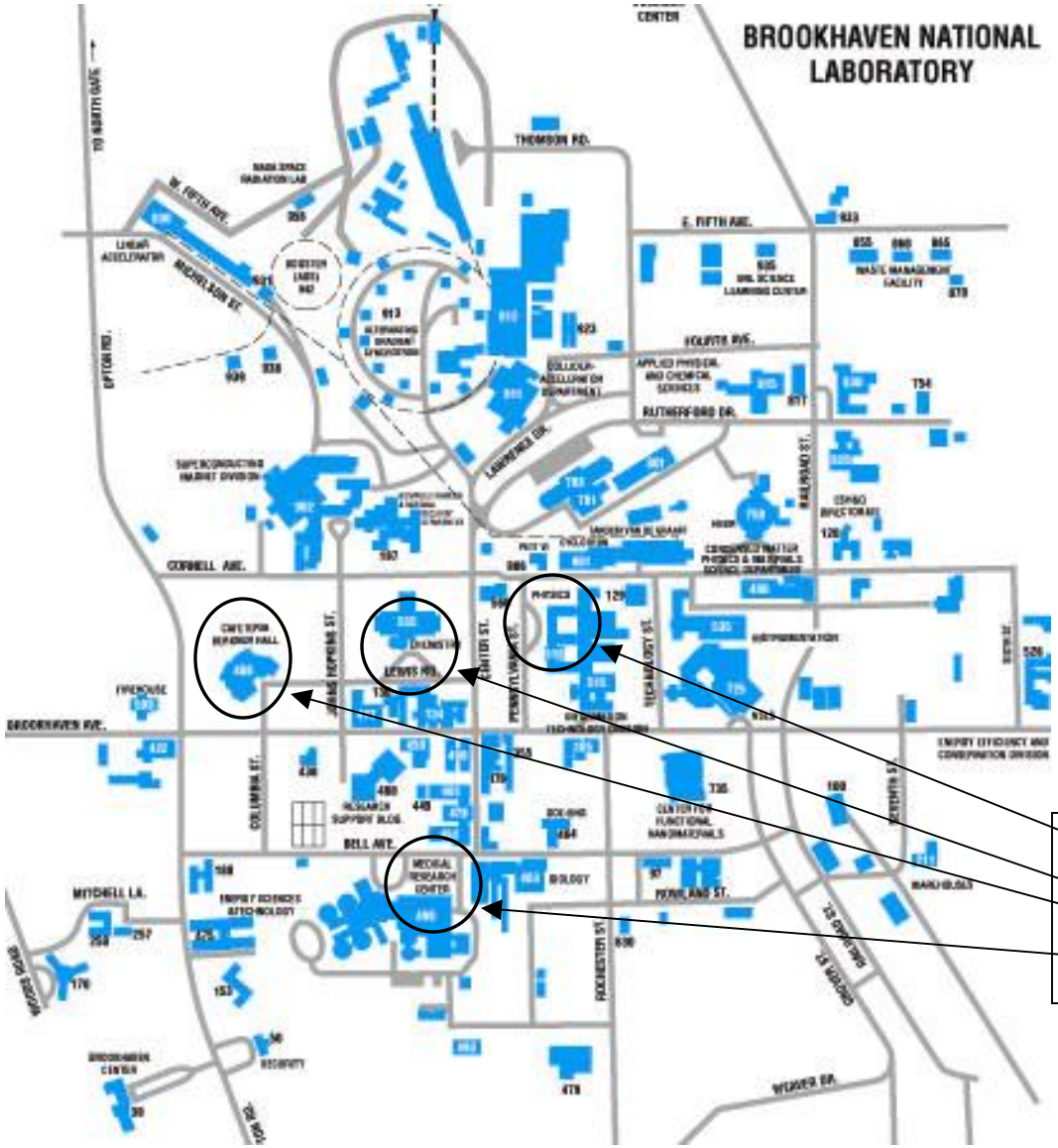
2008 Minority High School Apprenticeship Program(MHSAP)

Addison, Brianna	North Babylon	Ford, Kristen	North Babylon	Lee Fassett, Tiajah	St. John the Baptist
Agtuca, Lorabelle	Sachem East	Harrison, Victoria	Sachem East	Lee, Yeonkyung	Half Hollow Hills
Akerele, Dominic	Half Hollow Hills	Joiner, Breanna	Half Hollow Hills	Millings, Jonathan	Emanuel Christian
Bacchus, Johnathan	Half Hollow Hills	Jones, Taylor	Bellport	Rickford, Daniel	Mercy
Bynum, Davida	Longwood	Kendrick, Carl	Riverhead	Sordjan, Katiera	Longwood High
Calliste, Michael	Comsewogue				

2008 Open Space Stewardship Program (OSSP)

2008 Informal Education Internship

From left to right Rita Charlton, Donille Murray, Adriana Gomez, Kahille Dorsinvil, Omar Caraballo – Poster #129


BROOKHAVEN NATIONAL LABORATORY
Physics, Building 510
Chemistry, Building 555
Berkner Hall
Medical, Building 490

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- Brooklyn Opportunities in Science and Careers Program ***(*BOSC*)***
- Queens Community College BRIDGE program (**QCC Bridge**)
- Large Synoptic Space Telescope Corporation (**LSST**)
- Computer and Mathematics Scholar Support Alliance (**CAMSSA**)

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