Feb 8th, 9:15 AM - 10:15 AM

Poster Session 2

Honors College, ODU

SATURDAY, FEBRUARY 8TH 2014

9:15-10:15 AM (Learning Commons: Northwest Atrium)
Poster Session 2

1) Expression and Purification of HRV-14 3D Polymerase for In Vitro Studies

By JUHI RAMCHANDANI (Mentor: Dr. Steven M. Pascal)

Biochemistry and Biology

Rhinovirus is the etiological agent responsible for causing the common cold, a most prevalent, yet uncured, illness. A member of the Picornaviridae family, rhinovirus is found among other notable human pathogens, including poliovirus and hepatitis A virus. Members of this family share a common, highly conserved replication mechanism, which involves synthesis of a polyprotein that self-cleaves into several structural and non-structural proteins, such as 3D, an RNA-dependent-RNA polymerase necessary for genome replication. The overall goal of the Pascal lab is to understand the interactions of protein 3D during genome replication in the aims of facilitating drug design against Picornaviral infections.

2) Exploring the Plasmonic Optical Properties of Single Silver Nanoparticles

By SETH WARREN (Mentor: Dr. Nancy Xu)

Biology and Biochemistry

One of the emerging fields of research is that of nanomaterials. Nanomaterials are particles of small size, typically between 1-100 nm, made from noble metals, metal oxides, and other elements. Furthermore, their size lends them to have remarkable optical properties, such as their absorbance, scattering, and extinction, which are remarkably different than their bulk counterparts. This allows them to be used for far more applications in biology, chemistry, and engineering. In this study we look at the theoretical modeling of the optical properties of silver nanoparticles, in order to determine future sizes, shapes and surrounding environments for specific future applications.

3) The Effect of Harmonic Vibrations on the Disruption of a Bacterial Biofilm

By AMARILIS DYER (Mentor: Dr. Dayle A. Daines)

Biochemistry

Bacterial biofilms are composed of cell populations that adhere to a surface using a self-produced matrix of extracellular polymeric substances. Our goal was to identify the characteristics of harmonic excitation, namely the frequency, which would be most effective to de-laminate biofilms from an a biotic surface. First we determined which bacterium formed the maximum biofilm over 24 hours, then subjected these to various frequencies of harmonic excitation in 96-well plates and quantitated the effect of each frequency on biofilm disruption. We conclude that 1931 Hertz was the optimal frequency to de-laminate E. cloacae biofilms under the conditions of our assay.

4) A Solid Polarized Target for CLAS12 at Jefferson Lab

By MATHIEU EHRHART (Mentor: Dr. Stephen Bueltmann)

Physics

To be able to study the spin-dependence of the nucleon structure with electron scattering experiments, targets providing spin-polarized nuclei are needed. We report on the development of a new solid polarized target for the CLAS12 detector, presently being installed in Jefferson Lab's Hall B. The technique of dynamic nuclear polarization (DNP) requires very low temperatures around 1 Kelvin and a high magnetic field of around 5 Tesla. The very large natural polarization of free electrons inside the target material under these conditions is transferred to the nuclei via microwave radiation (electron Larmer frequency). The polarization of the protons and deuterons is measured with the nuclear magnetic resonance (NMR) technique.

5) Laser-Induced Fluorescence and Optical Emission Spectroscopy used for Plasma Diagnostics

By JOSEPH NEWTON (Mentor: Dr. Leposava Vuskovic)

Physics

Gas discharges of Argon can be characterized by a method called optical emission spectroscopy (OES). The spectral lines can provide information regarding which energy excitations and emissions occur and how much intensity those transitions have. When atoms are excited by electron impacts, those electrons exchange energy by the emission of photons; this is the basis of OES. Despite OES's effectiveness with finding certain population densities, the population density of metastable states cannot be determined without an external source of excitation such as a laser. Laser-induced fluorescence is a viable option for determining this value. By combining optical emission spectroscopy and laser-induced fluorescence, we were able to characterize Argon discharges in the supersonic gas flow and well as Cl2/Ar plasma for the surface processing of cylindrical cavities. The population densities of the s and p levels were determined as well as electron density and electron temperature for varying pressures.

6) A New Simulation Architecture to Reduce the Computational Complexity of Agent-Based Simulations

By JESSE CALDWELL (Mentor: Dr. Jim Leathrum)

Modeling, Simulation and Visualization Engineering

Agent-based simulation is an emerging field of simulation, which can be used to simulate very unique systems. One of the largest issues with agent-based simulation is their computational complexity. This project takes a new approach at the underlying simulation architecture to improve the performance by reducing the computational complexity of the underlying simulation architecture. Using this new simulation architecture, the project was able to simulate an order of magnitude or more agents than traditional agent-base simulations.

7) A Multifractal Approach to Human Brain Tumors

By RANDALL MAYS (Mentor: Dr. Khan Iftekharuddin)

Electrical Engineering

Automated brain tumor detection methods require robust processing methods to accurately identify regions of interest for use in a clinical setting. Tumor regions of interest consist of necrotic regions, active tumor growth, and the associated edema surrounding the tumor. This research is to identify additional features in MR imaging using multifractal analysis to improve accuracy in image segmentation. Supplementing current methods with multifractal analysis will provide improved robustness in the automated process and thereby improve accuracy in medical diagnosis and prognosis.

8) Power Control System for Small Satellites

By JASON HARRIS (Mentor: Dr. Dimitrie Popescu)

Electrical Engineering

ODU is conducting research into launching satellites. The purpose of this research experiment is to investigate the electrical characteristics of lithium polymer batteries and to develop a power management system. The batteries are currently being investigated to see how many charge cycles they can have. A power management system will be designed to be capable of charging the batteries and withdrawing power from them when needed. The system will be connected to solar cells which will have a constantly changing orientation with respect to the sun, so it must be designed to be as efficient as possible.

9) Correlational Study of Open Circuit Resonant (SANSEC) Sensor's Electric Field Distribution on Lightning Attachment

By KAYLA FARROW (Mentor: Linda L. Vahala)

Electrical Engineering

Lightning-direct effect current tests were conducted on multiple SansEC sensor configurations to evaluate their ability to withstand the incident lightning energy and protect the underlying composite. Test results indicated several SansEC sensor geometric configurations demonstrated an intrinsic ability to steer the lightning current along the corner of the sensor. To investigate this phenomenology, electromagnetic computational simulations were conducted to calculate the electric field distribution on the SansEC sensor's conductive trace to determine if the associated electromagnetic radiation preceding lightning attachment establishes modal structures on the conductive trace which predisposition the direction of the current flow. The simulations provide a means to

visualize the trace's modal structure and identify electric field regions residing on the sensor. This research presents a correlational study of the SansEC sensor's computed electric field distribution to the measured lightning propagation direction for various Sans EC sensor configurations.

10) The Use of Flash Hydrolysis as a Means of Extracting and Recycling Nutrients during Production of Algae Biofuels

By JONATHAN RICCI (Mentor: Dr. Sandeep Kumar)

Mechanical Engineering

Algae biofuels show a great deal of promise as a safe and renewable source of fuel. However, there are currently some limitations in the process that make algae biofuels less efficient than other potential alternative energy sources. For example, algaetends to use a large amount of Nitrogen and Phosphorus. These nutrients, Phosphorus in particular, are valuable and finite. In this project, we used flash hydrolysis in subcritical water in order to remove the nutrients from the algae before it is processed into biofuel. These nutrients can then be recycled to make the process more efficient and less resource intensive.

11) Synthesis of PbTe and PbSe Thin Films by Atomic layer Deposition for Thermoelectric Applications

By KAREN BOLLENBAH (Mentor: Dr. Helmut Baumgart)

Engineering Science

This study successfully established, for the first time, a thermal atomic layer deposition process (ALD) to synthesize nanolaminate superlattice structures of alternating layers of lead telluride (PbTe) and lead selenide (PbSe) thin films on silicon (Si) substrates covered with native oxide. PbTe and PbSe are AIVBVI narrow gap semiconductor lead chalcogenides with an FCC rock salt structure. PbTe is of particular interest due its high operating temperature of 600-850 K and melting point of 900K which is well suited for automotive and industrial applications.

12) Antibiotic Resistance in the Vibrio Vulnificus Isolated from the Chesapeake Bay during the Summers of 2006 and 2013

By AMANDA LAVERTY (Mentor: Dr. Fred C. Dobbs)

Ocean and Earth Sciences

Vibrio vulnificus is a human pathogen that accounts for 95% of seafood-related deaths in the United States. The objective of this study was to assess whether antibiotic resistance in V. vulnificus, isolated from the Chesapeake Bay, has changed over time. Antibiotic-resistance profiles of strains collected and cryo-preserved in 2006 were compared with profiles of strains isolated in summer 2013. In both years, samples were collected from the water column and from oysters. A greater percentage of isolates from 2013 were resistant to streptomycin, along with increased intensities of resistance to the antibiotic. These results suggest increased antibiotic resistance over time.