TRIDENT SCHOLAR CONFERENCE

Conference Opening Remarks and Presentations

0855-1200 and 1330-1645
Thursday, 17 April 2008
Rickover Hall, Room 103

Conference Moderator
Professor J. E. Shade
Deputy Director of Research and Scholarship

0855
Welcome and Opening Remarks

0900
Midshipman First Class Daniel D. Hartig

A Parallel Implementation of Two-Dimensional, Lagrangian Shallow Water Equations

A new parallel code for solving the one and two-dimensional shallow water equations has been developed in MATLAB®. The numerical method is Lagrangian-based and has been tested on variable-bottom bathymetry and various wind forcing

0945
Midshipman First Class Michelle B. Mattingly

A Mathematical Model for the Acoustic and Seismic Properties of the Landmine Detection Problem

The problem of detecting a buried landmine was modeled as a circular membrane flush-mounted in a rigid substrate lying beneath atmospheric and soil layers and insonified by a point source. Eigenfunction expansions for pressure and velocity were derived and formulas for the resonant frequencies found.

1030
Midshipman First Class Joshua W. Major

Design, Synthesis and Testing of Metabolically-stable Antimalarial Compounds

This study developed a series of compounds designed to possess anti-malarial activity and to be stable toward metabolizing enzymes. The novel compounds were synthesized by a four step process, characterized through nuclear magnetic resonance spectroscopy and then submitted for in-vitro anti-malarial testing. As such, the project is a contribution to the early stages in the development of an effective antimalarial medication.

1115
Midshipman First Class Jeffrey E. Vandenengel

Evolution in a Test Tube: Exploring the Structure and Function of RNA Probes

Previously, RNA molecules that could detect the presence of a small target molecule were produced by *in vitro* selection (natural selection in a test tube). This project attempted to improve the function of these RNA probes by partially randomizing their sequences and repeating the selection. The progress of the selection was monitored by examining how the function and the sequence of the RNAs changed with each new "generation" of molecules.

1330
Midshipman First Class Joanne D. So

An Essential Protein Repair Enzyme: Investigation of the Molecular Recognition Mechanism of Methionine Sulfoxide Reductase A

This project used spectroscopic techniques to investigate the mechanism by which the oxidative repair enzyme MsrA recognizes and binds to biomolecules in need of repair. Using both the intrinsic fluorescence of MsrA and the extrinsic fluorescence of the dye ANS, it was possible to observe and compare the interactions of MsrA with a wide range of damaged and normal biomolecules. Complementary spectroscopic techniques revealed the conformation of the MsrA protein backbone and the extent of oxidative repair.

1415
Midshipman First Class William Eucker IV

Probing the Interaction of Ionic Liquids with CO_2: A Raman Spectroscopy and Ab Initio Study

Ionic liquids (ILs) are unique solvents that have been shown to selectively dissolve carbon dioxide from gaseous mixtures. We are using a combined experimental and computational effort to gain a fundamental understanding of the chemistry underlying this selective dissolution. This knowledge will help guide the further improvement of ILs for carbon dioxide removal in applications ranging from sequestration of green house gas emissions to purification of submarine air.

1455
Midshipman First Class Michael E. Eyler

Structure of Quasar Continuum Emission Regions and Cosmology from Optical and X-ray Microlensing in Gravitationally Lensed Quasars

This project investigated the structure of quasars, the most luminous objects in the universe. Little is known about the structure of quasar continuum emission regions because their angular size is much smaller than the resolution limit of conventional telescopes. Circumventing this limitation, the general relativistic phenomenon of gravitational lensing was exploited to probe the central engines of five quasar systems at optical and X-ray wavelengths.

1545
Midshipman First Class Gerald E. Vineyard

Investigation of the Current Turn-off Characteristics of a GTO Thyristor in an Inductive Pulse Forming Network

This research investigated factors that influence the capability of a Gate-Turn-Off (GTO) thyristor semiconductor switch to interrupt current in an inductive-based Pulse Forming Network (PFN). A test fixture was developed and experimental data collected to facilitate evaluating three parameters of interest: gate turn-off pulse characteristics, snubber circuit values, and pulse repetition rate. The results provide guidance as to how to extend the operational capability of a GTO thyristor functioning as an opening switch in a PFN rail gun application.