



**U.S. COAST GUARD ACADEMY
ANNUAL RESEARCH REVIEW
2001-2002**



*Center for Advanced Studies
United States Coast Guard Academy
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cga.edu/academic/cas/cas.htm*

U.S. Coast Guard Academy
2001-2002 Annual Research Review



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Faculty and cadets at the U.S. Coast Guard Academy are actively engaged in a wide variety of research and scholarly activities. This Annual Research Report for the 2001-2002 academic year documents these activities and clearly illustrates the great range of intellectual expertise among the Academy faculty. This is the first such comprehensive report. Its purpose is to foster a greater awareness of the intellectual resources at the Academy, within and beyond the Academy and the Coast Guard.

This 2001-2002 Annual Research Report lists and describes, for each academic department, faculty research, cadet research and any graduate theses or dissertations completed by Coast Guard officers who are currently serving as Academy faculty. During this academic year, faculty scholarship resulted in published papers, essays or poems in 22 different journals, books or conference proceedings. In addition, two faculty authored or edited complete books: Maritime Law Enforcement by CDR Bruce Dalcher, and The Andrew Johnson Companion by Assistant Professor Richard Zucek. Faculty members also attended and presented papers at 35 professional conferences. The cadet studies listed in this report were primarily done as part of a required senior project or as an elective independent research project. Many of them have a direct applicability to Coast Guard needs, and all of them are of very high quality and provide cadets with outstanding developmental opportunities.

The report was prepared by the Academy's Center for Advanced Studies (CAS), which was first established in 1990 and serves to support and facilitate faculty and staff scholarly activities at the Coast Guard Academy. The Center publishes a report series, maintains a web page and provides funding for selected faculty members during the summer inter-session. CAS reports published during the 2001-2002 academic year included studies conducted by faculty in the Engineering, Mathematics and Humanities departments as well as the Leadership Development Center.

Two faculty were selected as Summer Research Fellows in 2001. Professor David Weber worked on innovations in economics education, and LCDR Jonathan Heller continued his research on organizational creative behavior. As is always the case, it was very difficult to pick two faculty members in support of this program as all proposed research projects were of a very high caliber.

Scholarly activities at the Coast Guard Academy continue to enrich the educational environment as well as provide expertise to the Coast Guard and model the importance of continued lifelong learning.

A handwritten signature in blue ink, appearing to read "R. C. Olsen, Jr.", is written over the typed name and title.

R. C. OLSEN, JR.
Rear Admiral, U. S. Coast Guard

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PUBLICATIONS

Papers and books

During the 2001-2002 academic year, faculty at the U.S. Coast Guard Academy published original scholarship in the following journals, books and conference proceedings:

Journals:

Environmental Forensics	Journal of Physical Oceanography
Experiments in Fluids	Journal of Vocational Behavior
Journal of Economic Education	Professional Mariner
Journal of Financial Markets	Russian Politics and Law
Journal of Forensic Science	The Writing Instructor.com
Journal of International Business and Entrepreneurship	U.S. Naval Proceedings
Journal of Oceanic and Atmospheric Technology	

Books:

The Oxford Encyclopedia of American Literature
The Dictionary of Literary Biography: American Radical and Reform Writers
The Blackwell Companion to American Fiction, 1865-1914
Post-Bellum, Pre-Harlem: The Achievement of African-American Writers, Artists, and Thinkers, 1880-1914
Twisted from the Ordinary: Essays on American Literary Naturalism
Divining Beauty
Business Research Yearbook: Global Perspectives

Conference Proceedings:

Frontiers in Education Conference
The Institute of Navigation National Technical Meeting
The 18th Annual Review of Progress in Applied Computational Electromagnetics
The Fourth Symposium on Radiolocation and Direction Finding
ASME Bioengineering Division, International Mechanical Engineering Congress and Exposition
Eastern Academy of Management Conference
Hawaii International Conference on Statistics

The following books were authored and/or edited by CGA faculty:

Revision (3rd) to Maritime Law Enforcement text (McGraw-Hill)
CDR B. Dalcher
The Andrew Johnson Companion (ABC-Clio Publications)
Assistant Professor R. Zuchek

Center for Advanced Studies (CAS) Reports

Reports published by the Center for Advanced Studies are not peer reviewed. They are all authored by CGA faculty, sometimes in conjunction with cadets or researchers at other institutions. They are numbered sequentially according to the calendar year of publication. The following reports were published by CAS during the 2001-2002 academic year. Copies of these reports are available from the CAS website (<http://www.cga.edu/academics/cas/cas.htm>).

Report #

- 01-01 **Internet Based Design: e-Design and e-Decision Making**
Vincent Wilczynski and John J. Jennings
- 02-01 **Detecting Transient Signals Having Unknown but Contiguous Power Spectra**
Joseph J. Wolcin
- 03-01 **Practical Experience and Operational Requirements for On-Board Risk Management Under Marginal Stability Conditions**
Eric J. Shaw
- 04-01 **An Innovative Investigation of the Relationship between Fisheries Equipment Design and Marine and Occupational Accidents in the Inshore Scallop Fishery of the Northeastern United States**
Jeffery R. Ciampa, Vincent Wilczynski, Thomas J. Smith and Ann S. Backus
- 05-01 **Uniforms Only Gibbs Sampling Using Nested Slice Samplers**
Kevin C. Mahoney
- 06-01 **Safety Engineering in the Commercial Fishing Vessel Industry**
Vincent Wilczynski
- 01-02 **Digital Down Converter (DDC) H-Field Loran-C Navigation Receiver: Performance Analysis, Flight Test Update, and GPS/WAAS Integration**
Richard J. Hartnett, Keith C. Gross, Greg J. Czerwonka and Herb H. Holland, Jr., Mitch Narins, Christian A. Oates, George Sanders, Thomas Gunther, Ken U. Dykstra and Dave Larson
- 02-02 **Crossing the Bow: Identifying Jurisdictional Overlap & Harmonizing Governmental Decision-Making in the U.S. Marine Transportation System**
Carl A. Schwaab, Patrick N. Newman and Cristian Mattoon
- 03-02 **USCG Academy's Efforts in Digital VHF Direction Finding**
Keith C. Gross, Richard J. Hartnett, Michael E. McKaughan, Kevin R. Shmihluk, Joseph Benin and Christian A. Oates
- 04-02 **Training the Cyber Defenders of Tomorrow**
Gregory W. Johnson
- 05-02 **Directional Signal Strength Sensor for Differential GPS Beacons**
Keith Gross, Michael McKaughan, Richard Hartnett, Lee Hartshorn, Daniel Everette and Christopher Armstrong
- 06-02 **Creating Virtual Teams for Engineering Design**
Vincent Wilczynski and John J. Jennings

CONFERENCES ATTENDED

CGA faculty presented papers or workshops at the following conferences during the 2001-2002 academic year:

American Culture Association conference
American Fisheries Society
American Literature Association's symposia
American Society of Engineering Education Annual Conference
Annual Conference on Teaching Economics
Annual Convention of the American Academy of Social and Behavioral Sciences
Annual Meeting of the American Political Science Association
Annual Meeting of the International Studies Association
Annual Review of Progress in Applied Computational Electromagnetics
ASME Bioengineering Division, International Mechanical Engineering Congress and Exposition
Carolina Conference on Romance Literatures
Consortium for Advanced Manufacturing-International, Cost Management Systems Program Quarterly Conference
Eastern Academy of Management Conference
Eastern Illinois University Conference for History Teachers
Far West Popular Culture/American Culture Association (ACA) conference
Feminisms and Rhetoric's Conference
Financial Management International Annual North American Meeting
Financial Management International Annual European Meeting
Frontiers in Education
International Academy of Business Disciplines 14th Annual Meeting
International Business Conference of the Society of Management
International Congress on Medieval Studies
International Estuarine Research Federation Conference
International Gothic Association Biannual Convention
International Loran Association (ILA) Technical Conference
International Symposium on Capillary Chromatography and Electrophoresis
Institute of Navigation National Technical Meeting
National Council of Teachers of English Conference
National Science Teacher's Association's (NSTA) National Convention
New England Association of Teachers of English
Northeast Business and Economics Association Annual Conference
Northeast Modern Language Association Annual Conference
Popular Culture/American Culture Association Annual Conference
Southern New England Chapter of the American Fisheries Society
Symposium on Radiolocation and Direction Finding

DEPARTMENT OF ENGINEERING

Professor Howard Dunn, Department Head

Civil Engineering Section

Professor David Mazurek, Section Chief

a. Faculty Scholarship

Name of Project: **DGPS Reference Station Mast Movement Study**

Faculty: CDR Jonathan Russell, Professor David Mazurek

Sponsor: C2CEN

Differential GPS uses a network of small cantilevered land based towers to provide correction information to the satellite based GPS signal, resulting in position information potentially accurate to within a centimeter. Apparently researchers are trying to use DGPS as a surveying instrument, for example, to measure earth plate tectonics and motion. A problem is that the tops of the DGPS reference towers move as much as a foot during strong winds, thus significantly decreasing short term DGPS accuracy. Research is underway to determine how much the tops of DGPS masts move during wind, accounting for such effects as base anchor type and size on tower motion. Ultimately, a cost/benefit curve for adding guys and guy anchors to stabilize the tower top and reduce tower motion will be developed.

Name of Project: **Teaching Statics and Engineering Design to Freshmen**

Faculty: CDR Jonathan Russell

The US Coast Guard Academy (USCGA) began teaching a new freshman engineering course titled Statics and Engineering Design (SED) in the Fall 2000 semester. The new course represents a significant change from the Introduction to Engineering and Design course that had been taught at USCGA for more than 20 years. Teaching statics to freshman is not new; however, unlike most institutions, all freshmen at USCGA take the same first course in engineering regardless of their intended major. The critical factor that allows us to successfully teach a statics-based course to non-engineers, yet provide an acceptable foundation in mechanics to future engineers is that the order and choice of topics was new. Many have argued that design is an essential component of all freshman engineering courses. In SED, we introduce a six-step problem solving process that is identified by the acronym DRIDS-V. This same process is not only used in other engineering classes but it is also used in several other freshman level classes in other departments. In SED, we use DRIDS-V on multiple open-ended group projects that require statics-based design and hands-on building of a system. Each project has a clear goal and multiple constraints, yet affords the cadets many opportunities to be creative while solving the problem. Nightly closed ended statics homework is completed using a three-step subset of the full design process. The initial success of the course can be partly measured in the recruiting of would-be non-engineers to engineering. By giving all USCGA freshman a fun yet “real” engineering course, it took away their fear of engineering and has resulted in an increase in the number of qualified applicants to the engineering majors. A comparison is made showing that future engineer SED cadets performed as well as Sophomore Statics cadets on a common multiple choice final exam.

Publication: Statics and Engineering Design—a New Freshman Engineering Course at the U. S. Coast Guard Academy, J.C. Russell, Frontiers in Education Conference Proceedings.

b. Cadet Scholarship

Name of Project: **East Coast Greenway Rails-to-Trails**
Cadets: 1/c Neal Armstrong, 1/c Dorothy Bienhoff, 1/c Pete Bosma, 1/c Jon Burby,
1/c Tom Mansell, 1/c Nate Rumsey, 1/c Tiffany Thompson, 1/c Todd Wimmer
Faculty Advisor: LT David Palazzetti
Sponsor: Connecticut Department of Environmental Protection

Continuing the Academy's support of the Connecticut Greenways Program, the senior Civil Engineers constructed a 160' pedestrian bridge over the Hop River in Willimantic, Connecticut. This bridge connected several miles of nature trails along the East Coast Greenway, a 2,600-mile long multi-use trail system being established along the eastern seaboard. Starting with an abandoned three-span railroad bridge, the cadets designed a new decking and railing system to support pedestrian, horse, and emergency vehicle traffic. After finishing the design, they fabricated the bridge with support from the Connecticut Army National Guard.

Name of Project: **Shipboard Wastewater Treatment**
Cadets: 1/c Rebecca Burdick, 1/c Jess Fontaine, 1/c Linnea Van Gansbeke,
1/c Carrie Seay, 1/c Matthew Breckel, 1/c Rachel DiGaudio
Faculty Advisor: Associate Professor Sharon Zelmanowitz
Sponsor: CG Engineering Logistics Command – Baltimore; COMDT (G-SEN)

Cadets completed a capstone project to help the Coast Guard study the feasibility of implementing membrane bioreactors for wastewater treatment onboard ships to meet strict anticipated discharge regulations for sewage from ships. The team identified criteria and constraints for a shipboard system to treat a combination of greywater and blackwater on the USCGC WILLOW. This involved developing data on space and logistical constraints, wastewater generation rates and quality, and operational schedules. Then the team designed, built, and tested a lab-scale membrane bioreactor to be used in future research examining the feasibility of treating shipboard wastewater. The lab-scale system was tested for almost 2 weeks using a synthetic wastewater and seed material from a local wastewater treatment plant. The cadets also designed a full-scale shipboard version of their system that met the requirements of the WILLOW. Future research will focus on using the lab-scale reactor to evaluate the ability of membrane bioreactors to treat shipboard wastewater, and further identifying the feasibility and design specifications for using membrane bioreactors onboard ships.

Name of Project: **USCGC OUACHITA Pile Driving Rig**
Cadets: 1/c Joseph Silkowski and 1/c Joseph McPherson
Faculty Advisor: CDR Jonathan Russell
Sponsor: CG Group Ohio Valley

In the spring of 2001 (then) 1/c cadets Silkowski and McPherson helped CDR Russell design a pile-driving rig for the USCGC OUACHITA, a western river buoy-tending tug & barge. OUACHITA is responsible for maintaining hundreds of fixed aids that sit atop pilings at the edge of waterways. Previously, OUACHITA did not have pile-driving capability. Thus if replacement pilings were needed or new pilings desired, a contractor had to be hired. Based on the USCGA design, a prototype pile-driving rig was built and installed on OUACHITA in the summer of 2001. OUACHITA has since driven more than a 100 piles saving the CG an estimated \$1M. BMCS Evans, OIC of OUACHITA, reports that in his opinion the simple detachable rig allows him to drive piles faster and more safely than the purpose-built pile driving barges used on the gulf coast. The CG now plans to install the pile-driving rig on the rest of the western river tenders. CDR Russell recently provided CG Group Ohio valley with revised drawings and specifications for an improved rig.

Electrical and Computer Engineering Section
CAPT Richard Hartnett, Section Chief

a. Faculty Scholarship:

Name of Project: **Co-Locating DGPS And Loran Transmitters**

Faculty: Professor M. E. McKaughan

Sponsor: U. S. Coast Guard Command and Control Center (C2CEN), Portsmouth VA.

This paper reviews C2CENs methodology for computer modeling of both diplexing and co-location using the LORAN tower top-loading element support guy as the DGPS antenna. The methodology leading to the final design is presented. Modeling and actual test results are presented plus plans for future implementation. Estimates of installation and operational savings are included.

Publication: Presented at the Institute of Navigation National Technical Meeting, 28 – 30 January 2002, San Diego, CA. pages 352 – 361 of the meeting proceedings

Name of Project: **Directional Signal Strength Sensor For Differential GPS Beacons**

Faculty: Associate Professor K. C. Gross, Professor M. E. McKaughan,

CAPT R. J. Hartnett

Sponsor: U. S. Coast Guard Command and Control Center (C2CEN), Portsmouth VA.

Efforts are underway to develop a directional signal strength sensor for Differential GPS beacon transmissions. Our sensor provides the ability to perform DGPS beacon field strength measurements using an electronically steerable antenna array. This tool will be very useful for validation of DGPS coverage prediction software, and for site certification and troubleshooting. The steerable nature of this sensor provides the ability to perform spatial filtering while analyzing the DGPS beacon spectrum. This should prove to be an invaluable tool for troubleshooting interference issues. The receiver consists of an antenna array (an H-field crossed loop antenna and a whip antenna), analog amplifiers and filters, an analog to digital converter and a MATLAB® based, GUI driven digital back end. The status of this development effort and preliminary results are presented.

Publication: Presented at the Institute of Navigation National Technical Meeting, 28 – 30 January 2002, San Diego, CA. pages 370 – 375 of the meeting proceedings.

Name of Project: **USCG 270-Ft Class Medium Endurance Cutter - HF Antenna Study**

Faculty: Professor M. E. McKaughan

Sponsor: USCG Telecommunications and Information System Center, TISCOM

The United States Coast Guard (USCG) 270-foot medium endurance cutters are currently equipped with six high-frequency (HF) antennas (4 whip antenna and 2 mini-loop antennas), which are used predominately for long-haul and non-line-of-sight communications. The Coast Guard is planning to replace the mini-loop antennas on these cutters with additional whips. ARINC was tasked with determining the best locations for the replacement whip antennas. This effort required performing computer modeling and electromagnetic analysis of the HF whip antennas on the 270-ft cutter to determine the radiation characteristics of the new antennas at various locations. The radiation characteristics were compared to determine those locations that best met the USCG requirements. The antenna parameters examined include: 3-d radiation patterns, RF current distribution plots, antenna input impedance and coupling to other HF antennas.

This effort is a continuation of the analysis that was performed for the USCG and reported on at the 17th Annual Review of Progress in Applied Computational Electromagnetics. The earlier work entailed computer modeling and electromagnetic analysis of the HF antennas on the USCG aircraft assets and included HF propagation prediction analysis for the USCG HF Communications Stations.

Publication: Presented at the 18th Annual Review of Progress in Applied Computational Electromagnetics, 18 - 22 March 2002, Monterey, CA. pages 403 - 409 of the meeting proceedings.

Name of Project: **USCG Academy's Efforts In Digital VHF Direction Finding**

Faculty: Associate Professor K. C. Gross, CAPT R. J. Hartnett,
Professor M. E. McKaughan

Sponsor: Commandant, (G-AND); U. S. Coast Guard Research and Development Center
The U. S. Coast Guard Academy (USCGA) has developed a prototype Digital Very High Frequency super-heterodyne Direction Finding system (DVHF-DF) in support of the U. S. Coast Guard's National Distress Response System Modernization Project (NDRSMP). This receiver, which processes four independent channels of in-phase (I) and quadrature (Q) data, offers significant advantages over more conventional receivers. More specifically, receivers that can archive separate channels of I and Q data can perform post-processing spatial filtering to enhance intelligibility of the demodulated signals, they can perform direction finding independently on two or more signals in the same frequency band originating from different directions, and they can use archived data to perform speaker and platform identification, thereby assisting in hoax determination. Here we discuss hardware, software, algorithms, antenna array configuration, and preliminary test results, and we show how Numerical Electromagnetics Code (NEC) modeling was used to corroborate antenna re-radiation effects within the array.

Publication: Presented at the Fourth Symposium on Radiolocation and Direction Finding, 14 - 16 May 2002, Southwest Research Institute, San Antonio, TX., session 8, paper 3 of the meeting proceedings.

Name of Project: **Digital Down Converter (DDC) H-Field Loran-C Navigation Receiver: Performance Analysis, Flight Test Update, And GPS/WAAS Integration**

Faculty: CAPT R. J. Hartnett, Associate Professor K. C. Gross, LT G. J. Czerwonka,
H. H. Holland

Sponsor: Federal Aviation Administration (FAA)
In this work we present an update on airborne Loran-C H-field navigation sensor development at the U.S. Coast Guard Academy. This sensor offers significant advantages over more conventional E-field Loran-C receivers. More specifically, our receiver is an "all-in-view," multi-chain receiver that is significantly less susceptible to precipitation static, hence it is a better candidate for integration with GPS or WAAS engines. First we provide a brief description of our newly developed Interactive Circuits and Systems (ICS) 650 Digital Down Converter based Loran-C H-field sensor. Second, we summarize some of the flight test results from our summer 2001 flights on the Federal Aviation Administration Technical Center (FAATC) Convair 580 and Ohio University's Beechcraft King Air. Using the test data from our "all-in-view" receiver, we discuss our promising results in terms of availability, accuracy, integrity, and continuity, for enroute and approach phases of several flights. Finally, we discuss ongoing Federal Aviation Administration (FAA) sponsored work to improve receiver performance, and we describe our Kalman filter approach in integrating Loran-C, GPS, and WAAS information.

Publication: Presented at the 30th Annual International Loran Association (ILA) Technical Conference in St. Germain en Laye, France, October 2001.

Name of Project: **Training The Cyber Defenders Of Tomorrow**
Faculty: LCDR G. W. Johnson
Sponsor: National Security Agency (NSA)
The U. S. Coast Guard Academy (USCGA) Department of Engineering, Electrical and Computer Engineering Section participated in the second Cyber Defense Exercise (CDX). This exercise, as part of the Computer Communications and Networks Course (1432) is designed to increase cyber network security awareness for future military officers. Sponsored by the National Security Agency (NAS) and the Department of Defense (DoD) Public Key Infrastructure (PKI) Program Office, this year's exercise pitted the Naval Postgraduate School (NPS), Monterey, CA against the five federal service academies (USAFA, USCGA, USMA, USMMA, and USNA). Despite this being the first foray into Information Assurance and the Cyber Defense Exercise at the Coast Guard Academy, and despite having by far the smallest team in the competition, the cadets tied for second place with the Naval Academy. (USMA finished first for the second year).

Publication: USCGA Center for Advanced Studies Report CAS 04-02.

b. Cadet Scholarship:

Name of Project: **LORAN Remote Control Using Kalman Filtering**
Cadets: 1/c Brendan Evans
Faculty Advisor: LCDR S. Landry
Sponsor: U. S. Coast Guard Loran Support Unit (LSU), Wildwood, NJ
This project attempts to demonstrate that use of a Kalman filter would better control the LORAN-C local phase adjustments (LPAs) than the current system used by LCCS. While Kalman filter technology is superior to a linear least squares algorithm, the current method for controlling LPAs, a viable model of the LORAN system must be created. The problem is that the data obtained is already tainted by the LCCS algorithm, and does not represent the actual system on which the filter is to make its predictions. A program was written to re-format the existing data to facilitate its use. However, no algorithm has been developed to undo the effect of the LCCS algorithm on the data. This project is to be continued for further research and improvements.

Name of Project: **Directional Signal Strength Meter for the Differential Global Positioning System (DGPS)**
Cadets: 1/C Lee Hartshorn
Faculty Advisor: Associate Professor K. Gross
Sponsor: U. S. Coast Guard Command and Control Center (C2CEN), Portsmouth, VA.
By using digital signal processing, and applying existing research completed in radio frequency spectrum sampling, the concept of designing and building a directional signal strength meter for Differential Global Positioning System beacons transmitters was explored. Although the final meter has not been entirely completed, the system components are in place, and the concept has essentially been proven. Both the hardware and software pieces of the design have been tested and are working properly together. With further analysis of the gains of each antenna, beam forming and null steering calculations can achieve a higher level of accuracy. Furthermore, an algorithm to determine an absolute signal strength value must be written and integrated into the existing software. After extensive field testing, the signal strength meter will be ready for use in the DGPS field.

Name of Project: **Development of Loran-C “H-field” Navigation Receiver**

Cadets: 1/c Kevin Hasselman

Faculty Advisor: CAPT R. J. Hartnett, LT G. Czerwonka

Sponsor: Federal Aviation Administration (FAA), Atlantic City, NJ.

The Coast Guard Academy designed a Loran C “H-Field” navigation receiver in the years between 1996-2000. The original receiver was designed for someone walking through the woods or driving through a city. Recently, the Federal Aviation Administration (FAA) asked the Coast Guard Academy to adapt this receiver for use on highly dynamic platforms such as commercial jetliners. The current software receiver is based on original code that several people wrote over four years. Over time, the features added have made the software bulky, confusing, difficult to maintain, and complicated to update. In addition, it does not take advantage of the object-orientated capabilities of C++ or newer compiler features. Consequently, this project was started to rewrite the computer program to take advantage of new technology, improve the capabilities of the receiver, and make the program easier to update.

Name of Project: **LORAN and DGPS Signal Coverage Software**

Cadets: 1/c Christian Hernaez

Faculty Advisor: H. Holland, Jr.

Sponsor: U. S. Coast Guard Command and Control Center (C2CEN), Portsmouth, VA.

The currently used DGPS propagation prediction software, COAST, is user unfriendly, and not as accurate as required by present Coast Guard requirements. This senior design project developed a user-friendly graphical user interface (GUI) for prediction software developed at the Academy by CAPT (ret) B. B. Peterson and LTJG M. Danish in 2000. MATLAB® GUIDE was used for the GUI building and fast implementation of the existing functions. The majority of the objectives for this year were met and the results were outstanding. All graphical user interfaces were linked and tested for functionality and performance. Additionally, tasks for next year will be based on the uncompleted work for this year and feedback from the Navigation System Center.

Name of Project: **Automatic Positioning Report for Coast Guard Aircraft**

Cadets: 1/c Darain Kawamoto

Faculty Advisor: LCDR G. Johnson

Sponsor: Commandant (G-SEA) USCG, Washington, DC.

As Coast Guard radio communications systems incorporate the high-frequency (HF) Automatic Link Establish (ALE) technology, automated aircraft position reporting will be implemented. This project has been investigating methods of implementing such a reporting system. This year, the focus was on using the Customs Service TRACS box as a method of implementing ALE to provide position reports on Coast Guard Aircraft. The Custom TRACS box can be program by the Remote Command and Control (RCC) box to send positioning reports every 5 minutes. A TRACS gateway software program was developed that received TRACS from an RCC and converted it to OTH-GOLD format and send it to the Track Database Manger (TDBM) on the Coast Guard Data Network (CGDN+). Once the TRACS is stored on the TDBM, it can be accessed anywhere on the CGDN+.

Name of Project: **Antenna Modeling for Possible Co-Location of DGPS and Loran-C Transmissions**

Cadets: 1/c H. Lars McCarter

Faculty Advisor: Professor M. McKaughan

Sponsor: U. S. Coast Guard Command and Control Center (C2CEN), Portsmouth, VA.

The United States Coast Guard is responsible for operating and maintaining the nation's two primary maritime radio navigation systems, the Long-Range Navigation (LORAN-C) system and the Differential Global Positioning System (DGPS). In an effort to save the Coast Guard, the Department of Transportation, and the U. S. Government significant costs, this project has investigated locating nation-wide DGPS (NDGPS) transmitters at Loran-C transmitting stations. By creatively using the Loran-C transmitting antenna as a support structure for an NDGPS transmit antenna, the Radio Frequency Working Group (RFWG) believes that dual use of existing assets will permit these cost savings.

The emphasis of this project is to investigate the feasibility of dual-use antenna configurations through computer modeling and field-testing. Three potential co-location antenna configurations were researched, modeled, and simulated on the computer. One of these configurations was tested at the Coast Guard Loran Support Unit (LSU) in Wildwood, New Jersey. This work discusses the financial benefits of this effort, presents the antenna configurations investigated, and compares the results from the modeling effort and the field-testing.

Name of Project: **Data Converter Unit (DCU) / WMEC Upgrade**

Cadets: 1/c Benjamin Norris

Faculty Advisor: LCDR T. Routhier

Sponsored by: U. S. Coast Guard Command and Control Center (C2CEN), Portsmouth, VA.

Description of the project: The data converter unit aboard the 270' Famous class cutters consolidates information from the anemometer, Doppler speed log, optical surveillance system (OSS), gyrocompasses, and fathometer. The Data Converter Unit (DCU) takes the different analog signals from these sensors, converts them into digital signals in the form of data sentences that the Shipboard Command and Control System (SCCS) understands. Because of its age, repair of the current DCU is no longer cost effective. Additionally, the data from the current DCU is in an archaic format. The preferred format for the SCCS is the National Maritime Electronics Association (NMEA) standard, the accepted protocol for the marine community. This project presents the design of a new, programmable replacement system for the DCU. The information generated in the new DCU will be in the form of a standardized NMEA message.

Name of Project: **Digital VHF Direction Finding**

Cadets: 1/c Kevin Shmihluk

Faculty Advisor: Associate Professor K. Gross, CAPT R. Hartnett

Sponsor: Commandant, (G-AND); U. S. Coast Guard Research and Development Center

Digital Very High Frequency (DVHF) Direction Finding (DF) is a solution to some of the Coast Guard's problems in completing its missions of search and rescue and eliminating wasteful spending and undue risk of human life in responding to hoax calls. The Academy Electrical and Computer Engineering section is involved in a multi-year proof of concept effort to apply digital signal processing technology to this VHF DF problem. One continuing challenge has been to determine consistent bearings from the target. This year the characteristics of the antenna array were investigated in detail. From this analysis, it was discovered that significant signal contamination exists from multiple reflections of the signals by objects on the roof of McAllister Hall. Various techniques were investigated to reduce this multi-path contamination. As a result of this investigation, a much better understanding of the DF system was achieved. The antenna array was remounted to reduce the multi-path problem. Measurements indicate that the overall system performance has been improved significantly as a result of this detailed investigation.

Name of Project: **Improving the Performance of Coast Guard TCP/IP Applications Over SATCOM**

Cadets: 1/c Vince Z. Taylor

Faculty Advisor: LCDR G. Johnson

Sponsor: U. S. Coast Guard Research and Development Center; USCG TISCOM.

The primary purpose of this project is to reduce cost and increase efficiency of satellite usage by underway cutters. Building on two years of work, the focus of this year's effort is to evaluate the software that was created by Architecture Technology Corporation. The Dial-On-Demand router establishes and maintains a connection over a satellite link; the Web Proxy provides header caching and data batching and compression, and the Email Proxy stores, batches and compresses emails until a connection is established.

Test beds were created to simulate the cutters in the Coast Guard fleet. The software was evaluated through rigorous testing under various conditions. The software was corrected and evolved to meet criteria and circumstances. The results demonstrated that the software is a viable option in the ongoing battle to reduce costs by drastically decreasing connection time.

Mechanical Engineering Section

Professor Gregg Dixon, Section Chief

a. Faculty Scholarship:

Name of Project: **Air Engine as a Manufacturing Project in an Introductory Design Course**
 Faculty: Professor Gregg Dixon, CDR V. Wilczynski, LCDR Eric J. Ford
 This project involved inventing an air engine, producing a prototype and implementing use of this device in an introductory design course, both as an exercise for developing CAD capabilities and for acquainting students with manufacturing methods.

Publication: A paper on this project "Air Engine as a Manufacturing Project in an Introductory Design Course," was presented at the American Society for Engineering Education (ASEE) annual conference, 18 June 2002.

Name of Project: **Creating Virtual Teams for Engineering Design**
 Faculty: CDR V. Wilczynski, CDR J.J. Jennings (Dept. of Leadership and Management)
 Sponsor: National Collegiate Inventors and Innovators Alliance
 Virtual teams for engineering design are becoming more commonly used in industry and the engineering education community must prepare graduates for employment in such work environments. This work presents the collaboration, communication and coordination tools necessary for virtual teams and identifies the skills needed to guide virtual teams towards success. Collectively, the team organization, web based collaboration tools and virtual project management techniques from this work provide a template to create virtual teams for engineering design.

Publication: Submitted for publication to the American Society for Engineering Education Journal of Engineering Education.

Name of Project: **PROJECT E³: Excellence in Engineering Education**
 Faculty: Associate Professor C.J. Egelhoff, Professor J.A. Youngman (Dept. of Humanities)
 Sponsor: U.S. Coast Guard Academy
 In the decade of the 1990s, many Engineering schools across the country launched innovative programs to attract and retain underrepresented minorities and women into undergraduate degree programs. Many innovations of the 1990s proved remarkably and immediately successful. PROJECT E³ includes a nation-wide review of programs in Engineering colleges and universities with proven track records in increasing admissions, retention, and graduation rates and numbers of minorities and women; and to recommend programs and strategies compatible with USCGA missions and shared learning outcomes for consideration by the Senior Management Team. The objectives: (a) to increase admissions of underrepresented minorities and women in Engineering at USCGA; (b) to enhance the academic performance and retention of minorities and women in Engineering and, (c) to increase the number of USCGA graduates majoring in Engineering. Phase I initial report expected August 2002.

Name of Project: **Coronary Artery Stenosis Hemodynamics**
 Faculty: Associate Professor C.J. Egelhoff
 Heart disease is the leading cause of death in the United States, claiming between 500,000 and 1,000,000 lives each year. This basic research uses experimental and numerical approaches to investigate the blood flow in the coronary artery as narrowing develops. It has been hypothesized that the rupture of plaques in the coronary artery (the immediate precursor to heart attack) could be influenced by size, shape and wall roughness in addition to the pulsatile nature of the flow. This project is a team effort by members of the US Coast Guard Academy, faculty of the University of Idaho and researchers of the Idaho National Engineering and Environmental Laboratory.

Publication: Egelhoff, C.J., R.S. Budwig, J.K. Foster and B.L. Hansen, "Investigation of Coronary Artery Stenosis Hemodynamics Using Experimental and Computational Models: Influence of Flowrate, Size, Symmetry and Wall Roughness," ASME Bioengineering Division, International Mechanical Engineering Congress and Exposition, New York, NY, November 11-16, 2001.

Name of Project: **Design for Fatigue in Machine Elements**

Faculty: Associate Professor C.J. Egelhoff, E.M. Odom (University of Idaho)

Failure of systems and components resulting from fatigue is one of the most challenging and costly designs accomplished by today's industrial companies. However, one of the more difficult concepts to teach in machine component design courses is fatigue analysis of "real world" components. Without a heuristic to guide the student, this analysis is very difficult. We have developed a heuristic which is a combination of concept map and flow chart that give a student not only process but also directions for improvement of the analysis. The heuristic is a visual image that is simple and can be readily reproduced in a basic sketch. The visual quality (simple and striking) of these concept maps/flow charts produces ready access to the understanding which students ultimately develop.

Publication: Egelhoff, C.J. and E.M Odom, "Advanced Learning Made as Easy as ABC: An Example Using Design for Fatigue of Machine Elements Subjected to Simple and Combined Loads," Frontiers in Education Conference, Reno, NV, Oct 10-13, 2001.

Name of Project: **Learning From Disasters**

Faculty: Associate Professor C.J. Egelhoff

Engineering disasters are compelling events which interest students and provide a basis for teaching professional history and essential skills of the engineering discipline. This project is the development of disaster cases for undergraduate mechanical engineers, providing the content to integrate skills in research, writing, speaking, critical analysis and ethical evaluations. Students practice essential communication skills by writing for a non-technical reader and by giving a short speech on a technical topic.

Publication: Egelhoff, C.J., "Learning From Disasters: Developing Mechanical Engineering Topics," Frontiers in Education Conference, Reno, NV, Oct 10-13, 2001.

Name of Project: **Pedagogy for Engineering Thermodynamics**

Faculty: Professor Gregg Dixon

This project involved modifying the traditional approach to teaching a fundamental engineering course to utilize computer-based simulation tools rather than the more tedious and arcane tables of thermodynamic properties.

Publication: Presented at the American Society for Engineering Education (ASEE) annual conference in Albuquerque, New Mexico, June 2001. "Teaching Thermodynamics without Tables, Isn't it Time?" The paper received the award for the best paper in the session.

b. Cadet Scholarship:

Name of Project: **Solar Splash**

Cadet: ENS Samuel Alvord, ENS Anya Hughes, ENS Peter Igoe, ENS Eric Larsen, ENS John Luff, 1/C Thomas Rodzewicz and 1/C Sean Barnhill

Faculty Advisor: LCDR Eric J. Ford

Sponsor: Dean of Academics, CGA Alumni Association; Rodney Johnstone, former owner and designer of J-Boats; Siemens Solar Division; Hale Propeller of Old Saybrook

The world championship solar/electric boating competition is an annual event hosted by the Solar Energy and Petroleum Division of the American Society of Mechanical Engineers (ASME). The event draws colleges and universities from around the continent who design and build a battery and solar power operated boat in order to

perform a number of different requirements, including speed, maneuverability and endurance. This is the USCGA's seventh year entering the event with the competition being held in Buffalo, NY between 18 and 23 JUN 02.

Name of Project: **Remote Monitoring and Control of a Shipboard Fuel Supply System**
 Cadets: ENS Peter Gavin, ENS Christopher Lavin, ENS Roberto Trevino, ENS Matt Walsh, ENS Kyle Young
 Faculty Advisor: Professor William M. Simpson
 Sponsor: Dean of Academics; G-M

A monitoring and control system was designed, built and tested to detect simulated leaks in a commercial vessel's fuel oil system. Engine room fires due to fuel oil leaks are a preventable problem that has attracted the attention of the Coast Guard's Maritime and Environmental Safety Office. Working with representatives of G-M and local field inspectors, the cadet team identified the likely scenario for fuel leaks and constructed a simulated fuel system. Using pressure sensors, fluid mechanics principles, and a computer data acquisition system, the cadet team developed a system that continually monitors the fuel flow and shuts down the system when leaks as small as 1% of the original flow volume are detected. The cadet team submitted a patent application to the USDOT patent attorney for this work.

Name of Project: **Remotely Controlled Submersibles**
 Cadets: ENS Mario Gitte, ENS Orion Jones, ENS Adam Koziatek, ENS Jon Miller, ENS James Morrow, and ENS Chris O'Neil
 Faculty Advisor: CDR V. Wilczynski
 Sponsor: Dean of Academics; USCG Research and Development Center

The Coast Guard is currently investigating the use of remotely controlled and autonomous underwater vehicles for maritime surveys and security. With support and direction from the USCG Research and Development Center a cadet team designed, constructed and operated a remotely controlled submersible (CG UV1). The six foot long, 120-pound submersible is remotely controlled using radio control. In autonomous mode, the submersible executes scripted commands, such as a search algorithm. The vehicle can operated up to two hours on a charge for its two propulsion motors and two depth control motors.

Naval Architecture and Marine Engineering Section

CDR Kurt Colella, Section Chief

a. Faculty Scholarship:

Name of Project: **The Implementation of an Effective System of Assessment in the Engineering Department t the United States Coast Guard Academy**
 Faculty: CDR K. Colella

The United States Coast Guard Academy Department of Engineering has implemented a system of assessment to establish long-standing processes that improve educational programs and satisfy Engineering Criteria 2000. The system is cyclical in nature and involves assessment practices at the course, program and department (four programs) levels.

The implementation scheme was borne of strategic planning that gave rise to the formalization of assessment processes, and the development of "standardized" assessment tools (many of which already existed less formally). These processes are described herein.

The implementation of a formalized system has forced programs within the Department to more carefully reflect on outcomes and performance and has paid dividends by:

- (1) Providing clearer vision at all levels
- (2) Fostering better communication between programs
- (3) Facilitating CGA's high level of personnel turnover (primarily military transfers)
- (4) Simplifying preparation for the recent EC2000 visit

The implementation of an effective system has certainly not come without tremendous effort and many challenges. Assessment has clarified these challenges however, and provided the evidence and information necessary to address them in an effective and informed manner.

Publication: To be presented at Frontiers in Education Conference, Boston, MA, November 2002.

Name of Project: **Measurements and Scaling of Wall Shear Stress Fluctuations**

Faculty: CDR Colella, Dr. William Keith (NUWC Newport RI)

Measurements of velocity and wall shear stress fluctuations were made in an external turbulent boundary layer developed over a towed surface piercing flat plate. An array of 8 flush mounted wall shear stress sensors was used to compute the space-time correlation function. A methodology for in situ calibration of the sensors for ship hydrodynamic applications is presented. The intensity of the wall shear stress fluctuations, τ_{rms}/τ_{avg} , was measured as 0.25 and 0.36 for $R_0 = 3,150$ and 2,160 respectively. The probability density is shown to exhibit positive skewness, and lack of flow reversals at the wall. Correlations between velocity and wall shear stress fluctuations are shown to collapse with outer boundary layer length and velocity scales, verifying the existence of large scale coherent structures which convect and decay along the wall at an angle of inclination varying from 10 to 13 degrees over the range of Reynolds numbers investigated. The wall shear stress convection velocity determined from narrow band correlation measurements is shown to scale with outer variables. The space-time correlation of the wall shear is shown to exhibit a well defined convective ridge, and to decay 80% over approximately 3δ for $R_0 = 3,150$.

Publication: Paper accepted for publication in Experiments in Fluids.

b. Cadet Scholarship:

Design Project Description:

This year's senior design projects were focused on a notional 21st Century Academy training vessel to complement the forthcoming DEEPWATER fleet. The vessel would be used for cadet, PCO/PXO, and OCS training. The vessel would be appropriate for both underway and pier side training. Two different cadet teams generated conceptual designs that include hull form and structure, powering, and auxiliary and electrical systems. Cost analysis and crewing studies were also conducted.

Name of Project: **The Design of a 21st Century Coast Guard Academy Training Vessel**

Cadets: 1/c Ben Anderson, 1/c Malcolm Belt, and 1/c Paul Schurke

Faculty Advisor: CDR Colella, LT Corl

Name of Project: **The Design of a 21st Century Coast Guard Academy Training Vessel**

Cadets: 1/c C. Blomshield, 1/c S. Deweese, 1/c J. Heering, and 1/c J. McFerran

Faculty Advisor: CDR K. Colella and LT Corl

Name of Project: **Directed Study in Naval Engineering**

Cadet name(s): 1/c Malcolm Belt

Faculty Advisor: CDR Colella

Project Description:

The development of a user friendly, computer controlled, data acquisition system for CGA's Tow Tank facility. The project involved reconfiguring the present load cell arrangement and writing DAQ code (using LabView) to gather and process data.

Publication: Presented at the New England Section of the Society of Naval Architects and Marine Engineers, MIT, March 2002.

DEPARTMENT OF HUMANITIES

CAPT Robert Ayer, Department Head

a. Faculty Scholarship

Name of Project: **New War Lecture Series; Panels on the Global Aspects of Understanding the 9/11 Attacks**

Faculty: CDR Bill Brubaker, CDR Bruce Dalcher, LCDR Glenn Sulmasy and Mr. G. Donato
A series of panels and other activities to improve the Cadet Corps' understanding of the 9/11 attacks by demonstrating different academic disciplines' perspectives. Each panelist prepared a talk of about 20 minutes' length. These were delivered *seriatim* and then the panel took questions from the audience. Attendance was required for the Corps of Cadets and Officer Candidates.

Name of Project: **Revision (3rd) to Maritime Law Enforcement text**

Faculty: CDR Bruce Dalcher

A complete revision of this 600-page text for a core law course. This involved substantial rewriting, the addition of a new chapter, and multiple changes to cases illustrating the genesis of various points of law.

Publication: The text was published by McGraw-Hill's Primis division in July/August 2001.

Name of Project: **Dueling Presidents: A Comparative Assessment of Presidential Leadership – Abraham Lincoln and Jefferson Davis**

Faculty: Mr. Gary Donato

Publication: Paper presented at Three Rivers College on 6 June 2001.

Name of Project: **Does America Need a Foreign Policy: An Assessment of G.W. Bush**

Faculty: Mr. Gary Donato

Publication: Paper presented at Three Rivers College on 7 November 2001.

Name of Project: **Metaphor Becomes Reality: Container and Containment during the Cold War**

Faculty: Mr. Gary Donato

Publication: Paper presented Popular Culture Conference, University of Nevada Las Vegas, 1 February 2002.

Name of Project: **Changing Definitions of Citizenship**

Faculty: Mr. Gary Donato

Publication: Paper presented at Center for Lifelong Learning, Three Rivers College, 22 May 2002.

Name of Project: **Biographical Essays**
Faculty: Assistant Professor Robert Dowling
Biographical essays for the following individuals: "Charles Chesnutt," "John Dos Passos," "Hutchins Hapgood," "O. Henry," "Annie Proulx," and "Carl Sandburg." To be published in *The Oxford Encyclopedia of American Literature*. Ed. Jay Parini. New York: Oxford University Press, 2003.

Name of Project: **Hutchins Hapgood**
Faculty: Assistant Professor Robert Dowling
Forthcoming biographical essay in *The Dictionary of Literary Biography: American Radical and Reform Writers*. Ed. Steven Rosendale. Farmington Hills, MI: Gale Group, 2003.

Name of Project: **Immigrant Nation**
Faculty: Assistant Professor Robert Dowling
Forthcoming theorization of American immigrant narratives and ethnic writing in *The Blackwell Companion to American Fiction, 1865-1914*. Contributors will include the novelist John Updike and Harvard University English chair Lawrence Buell. Eds. Robert Paul Lamb and G. R. Thompson. Oxford, England: Blackwell Publishers, 2003.

Name of Project: **A Marginal Man in Black Bohemia: James Weldon Johnson in the New York Tenderloin**
Faculty: Assistant Professor Robert Dowling
Essay analyzing James Weldon Johnson's novel *The Autobiography of an Ex-Colored Man* in the context of the New York Tenderloin district's black bohemia of the 1890s. This essay has been approved for publication in the critical anthology *Post-Bellum, Pre-Harlem: The Achievement of African-American Writers, Artists, and Thinkers, 1880-1914*. Eds. Caroline Gebhard and Barbara McCaskill.

Name of Project: **Stephen Crane and the Transformation of the Bowery**
Faculty: Assistant Professor Robert Dowling
Essay analyzing Stephen Crane's New York writing in the context nineteenth-century cultural history. This essay is forthcoming in the critical anthology *Twisted from the Ordinary: Essays on American Literary Naturalism*. Ed. Mary E. Papke. Knoxville, TN: The University of Tennessee Press, 2003.

Name of Project: **Ernest Poole's *The Harbor* and the Industrialization of U.S. Maritime Culture. Panel discussion "Cargo: U.S. Waterfront Culture from 1911 to 9/11"**
Faculty: Assistant Professor Robert Dowling
This paper provides a historical analysis of Ernest Poole's novel *The Harbor* (1915) in the context of early 20th-century U.S. maritime culture. This was part of a panel discussion entitled "Cargo: U.S. Waterfront Culture from 1911 to 9/11."

Publication: Presented at the Far West Popular Culture/American Culture Association (ACA) conference in Las Vegas, Nevada (February 2002).

Name of Project: **Hutchins Hapgood, Victorian in the Modern World**
Faculty: Assistant Professor Robert Dowling
This paper deals with two themes concerning biography writing: 1) the problem of literary success among Victorians like the early 20th-century author and journalist Hutchins Hapgood who engaged the modern world on its own terms but failed to leave a lasting impression, and 2) the implications of a "first" biography (both mine and Hutch's) and what elements a "first" biography might require to succeed.

Publication: Presented at the American Literature Association's symposium, "Biography: Telling Lives, Telling Lies" in Puerto Vallarta, Mexico, December 2001.

Name of Project: **Nostalgia Nostrum: Recapturing Old New York 'Low Life' at the Turn of the 21st Century**

Faculty: Assistant Professor Robert Dowling

This paper suggests a way to interpret the uncanny proliferation of present-day historical novels and academic studies of Old New York "low life."

Publication: Paper presented at the American Culture Association conference, Southeastern Connecticut State University, New Haven, Connecticut, November 2001.

Name of Project: **Reversal of Fortunes: The Revision and Inversion by E. Annie Proulx's *The Shipping News* and Frank Norris's *McTeague***

Faculty Name: Assistant Professor Robert Dowling

This paper draws parallels between two novels: E. Annie Proulx's *The Shipping News* of Frank Norris's *McTeague*.

Publication: Paper was presented at the American Literature Association's symposium, "Contemporary American Authors" in Santa Fe, New Mexico, October 2001.

Name of Project: **Balancing Act: American Humor in a Time of Crisis**

Faculty: Assistant Professor Robert Dowling

This talk deals with the so-called "end of irony" phase of the post-September 11 American scene, and suggests that humor which directly addresses the event is precisely what the country needs to heal itself. It was given for a panel discussion entitled "Teaching After September 11" at the Graduate Center of the City University of New York in New York City, October 2001.

Name of Project: **Rewriting and Rereading Women: Josephine Butler's Biography of Catherine of Siena**

Faculty: CDR Lucretia A. Flammang

This paper argued that Josephine Butler, the well-known British nineteenth-century feminist, used her biography about Catherine of Siena rhetorically to counter prevailing Victorian narratives about women's lives. Butler's primary goal was to authorize women's political participation and voice in the public sphere.

Publication: The paper was delivered at the Third Biennial Feminisms and Rhetoric's Conference, October 2001.

Name of Project: **Transgressive Women, Transgendered Contexts**

Faculty: CDR Lucretia A. Flammang

Developed and organized a special conference session on the topic of transgressive women. Also served as the panel moderator.

Publication: This panel was part of the 2002 Northeast Modern Language Association Annual Conference, 11-13 April 2002.

Name of Project: **History of Victorian Feminism**

Faculty: CDR Lucretia A. Flammang

As a guest lecturer, developed and presented a three-hour seminar on the history of Victorian feminism.

Publication: This 17 April presentation was part of the course, "The Industrial Age," offered at Quinnebaug Valley Community College.

Name of Project: **Teaching Intercultural Conflict: The Case of Latinos Versus Latinos.**
Faculty: Associate Professor Jose Gonzalez
Presentation for participants attending conference, "Diversity Challenge," looking at the dichotomies that often appear among various Latino groups. Boston College, October 2001.

Name of Project: **Reincarnating Shakespeare: Strategies and Activities for Teaching the Bard's Plays**
Faculty: Associate Professor Jose Gonzalez, Assistant Professor Karen Wink
Co-presenter on workshop that provided that top ten tips for making Shakespeare come to life in the classroom. New England Association of Teachers of English, Nashua, New Hampshire, October 2001.

Name of Project: **Caribbean Literature: Integrating Readings into k-12 Classrooms.**
Faculty: Associate Professor Jose Gonzalez
Workshop for Connecticut public school teachers and college professors, Yale University, November 2001.

Name of Project: **The Evolution of the Hollywood Latino.**
Faculty: Associate Professor Jose Gonzalez
Panel chair on study of the representation of Latinos and Latinas in film.

Publication: Presented at the Northeast Modern Language Association, Toronto, Canada, April 2002.

Name of Project: **Accentuating the Modern, Muy Macho, Hollywood Accent: A Case of Abuse It or Lose It?**
Faculty: Associate Professor Jose Gonzalez
Delivered a paper on Spanish accents in American film, looking closely at the representation of Spanish accents by Anglo actors.

Publication: Presented at the Northeast Modern Language Association, Toronto, Canada, April 2002.

Name of Project: **Lola's Salvadoran Tortilla Stand**
Faculty: Associate Professor Jose Gonzalez

Publication: Poem published in Colere: A Journal of Cultural Exploration in 2002.

Name of Project: **Nantucket Schools**
Faculty: Associate Professor Jose Gonzalez

Publication: Poem published in Nantucket: A Collection, White Fish Press, 2001.

Name of Project: **Building the Gothic Image in America: Changing Icons, Changing Times**
Faculty: Professor Faye Ringel
Paper on how Americans have represented the Middle Ages in the built environment, from 1820 to the present.

Publication: Presented at the International Gothic Association Biannual Convention, Vancouver, Canada, June 2001.

Name of Project: **Beyond Harry Potter**
Faculty: Professor Faye Ringel
As Program Chair of the Centennial Celebration, presented workshop on incorporating fantastic literature into high school and college curricula.

Publication: Presented at New England Association of Teachers of English, Fall Conference, Nashua, New Hampshire, October 2001.

Name of Project: **Gothic Dark and Lite: Images of the Middle Ages for the New Millennium**
Faculty: Professor Faye Ringel
Paper contrasting the images of the Middle Ages found in contemporary fantasy and horror literature and films.

Publication: Presented at the University of Rhode Island conference on "The Uses of Popular Culture," October 2001.

Name of Project: **The Supernatural in New England**
Faculty: Professor Faye Ringel
Gave lecture to May meeting of Senior Ambassadors of Three Rivers Community College.

Name of Project: **The Mystique of Avalon: Marion Zimmer Bradley and the Neo-Pagan Mythos**
Faculty: Professor Faye Ringel
Paper surveying the changing image of King Arthur in popular literature and film, culminating in the success of Bradley's *The Mists of Avalon*.

Publication: Presented at a session on "Science Fiction/ Fantasy: Sacred or Secular" at the Popular Culture/American Culture Association Annual Conference, Toronto, Canada, March 2002

Name of Project: **Medievalist Millionaires: Robber Barons and the Dynamo**
Faculty: Professor Faye Ringel
Paper focusing on how millionaires such as Morgan, Rockefeller, Hearst recreated the European Middle Ages in America.

Publication: Presented at the 37th International Congress on Medieval Studies, Western Michigan University, Kalamazoo, Michigan, May 2002.

Name of Project: **New War Symposium**
Faculty: LCDR Joseph E. Vorbach III
Sponsor: USCGA MTS Initiative
Five-part symposium consisting of one Operation Spotlight lecture, 3 evening panel presentations and a threat response exercise (anti-maritime terrorism war game) designed to help cadets and officer candidates place the events of September 11, 2001 in context and to begin to consider the manner in which the changed environment was likely to affect them as newly commissioned officers in the Coast Guard.

Name of Project: **Bush, Fox, and the Border**
Faculty: LCDR Joseph E. Vorbach III

Publication: Paper presented at the Forty-Third Annual Meeting of the International Studies Association, March 2002.

Name of Project: **Liminal Voices Creating a New Space Between Two: selected liminalities in ¡Aloud!: Voices from the Nuyorican Poets' Café and Paper Dance: 55 Latino Poets**

Faculty: Assistant Professor Alexander Waid
Describe and analyze the cultural space between US and Hispanic Cultures in which US Latinos create poetry.

Publication: Presented at the Carolina Conference on Romance Literatures, March 21-23, 2002. Chapel Hill, NC.

Name of Project: **Raven Night Love**
Faculty: Assistant Professor Alexander Waid
A poem that narrates the events of a magically sheltered night.

Publication: Published in *Divining Beauty*, Watermark Press, November 2001.

Name of Project: **Dawn**
Faculty: Assistant Professor Alexander Waid
Surreal poem about the dawn.

Publication: To be published in *Letters from the Soul*, Watermark Press, Fall 2002.

Name of Project: **Deltitnu 9**
Faculty: Assistant Professor Alexander Waid
Free-verse poem about dynamic-fixation.

Publication: To be published in *Letters from the Soul*, Watermark Press, Fall 2002.

Name of Project: **Elementary Spanish I & II online (vignette)**
Faculty: Assistant Professor Alexander Waid
Highlights the computer-enhancements incorporated in Elementary Spanish I & II courses at the CGA.

Publication: To be published in *Journal of Computer Enhanced Learning*.

Name of Project: **Russian Politics and Law**
Faculty: Professor Nils H. Wessell
Sponsor: M.E. Sharpe, Inc., Publisher

Publication: Six 100-page issues of a bimonthly journal on Russian politics and foreign policy, translated from Russian scholarly journals with Editor's Introduction.

Name of Project: **Effective Comments for History Essays**
Faculty: Assistant Professor Karen Wink
Presented methods for commenting on students' essays.

Publication: Presented at the Eastern Illinois University Conference for History Teachers, Charleston, Illinois, October 2001.

Name of Project: **Reincarnating Shakespeare: Strategies and Activities for Teaching the Bard's Plays**
Faculty: Assistant Professor Karen Wink

Publication: Co-presented at a Shakespearian workshop at the New England Association of Teachers of English Conference, Nashua, New Hampshire, October 2001.

Name of Project: **Determining the Credibility of Websites for Research Papers.**
Faculty: Assistant Professor Karen Wink

Publication: Presented at a technology panel at the National Council of Teachers of English Conference, Baltimore, Maryland, November 2001.

Name of Project: **Rhetorical Pedagogy for Active and Passive Voice**
Faculty: Assistant Professor Karen Wink

Publication: Published in The Writing Instructor. Com, May 2002.

Name of Project: **E³: Excellence in Engineering Education**
Faculty: Professor Judith Youngman, (with Associate Professor C. Egelhoff)
An identification and analysis of "best practices" in USCGA cohort institutions in the recruitment and persistence of women and underrepresented minorities in engineering. Research methods include literature and scholarly surveys, interviews and site visits.

Name of Project: **Constitutionalism, Citizenship and Human Rights in Advanced Western Democracies**

Faculty: Professor Judith Youngman

An assessment of the divergence between the United States and other advanced western Democracies on the extension of human rights claims and status to women. Those states denying human rights to women, such as the United States, are those in which Constitutionalism and the influence of religious fundamentalism/evangelicalism in politics intersect.

Publication: Paper presented at the Annual Meeting of the American Political Science Association.

Name of Project: **The Andrew Johnson Companion**
Faculty: Assistant Professor Richard Zuczek (with Dr. Glenna Schroeder-Lien)

An encyclopedia of 19th-century America history which uses a central figure to examine the social, political, economic, and cultural affairs of the time. Researched and written solely by two authors, without contributors.

Publication: ABC-Clio Publications, 2001.

Name of Project: **Encyclopedia entries**
Faculty : Assistant Professor Richard Zuczek
Research and compose entries on elements of South Carolina history, personages, and culture
Publication: Will be part of the *South Carolina Encyclopedia* by the University of South Carolina Press.

Name of Project: **Association of Lifelong Learners**
Faculty: Assistant Professor Richard Zuczek
ALL is an online history webschool designed by Yale-Oxford-Stanford universities to allow learned and interested alums the opportunity to continue to grow intellectually. The ALL program, once fully developed and underway, will resemble non-credit community learning programs, but with an electronic twist. ALL will provide access (at a cost) to individuals desiring a learning opportunity directed to specific books, topics, or areas of interest. The online sites will be completely interactive, with “students” communicating with each other and the specialist/instructor who coordinates and supervises the “course.”

b. Cadet Scholarship

c. Faculty Dissertations

Title of dissertation: **Authority, Responsibility, and Privilege: Developing Leaders of Character through Interpersonal Relations in Military Higher Education**
Faculty: LCDR John C. O’Connor III
Degree: Ed.D.
University: Harvard University, Graduate School of Education

U.S. Service Academies profess to develop “leaders of character,” but do they? Research literature suggests that an authoritative and transformational climate is crucial to the development of mature, ethical, and competent graduates who think critically and independently and engage in the dedicated self-reflection necessary for the development of strong psychosocial competencies, moral motivation, and strength of character. Therefore, the authoritarian environment with emphasis on transactional leadership, common at service academies, may produce unintended consequences.

While the results of historical research on the positive effect colleges has on the development of students’ moral judgment is equivocal (McNeal, 1994; Rest, 1986; Rest & Narvaez, 1991, 1994), the most recent research suggests that the role of the social environment, specifically student friendships and social networks, is most important (Derryberry & Thoma, 2000).

Employing a grounded approach, suggested by the work of Kohlberg (1984) and Schultz & Selman (1998), cadets at the U.S. Coast Guard Academy were interviewed to explore how interpersonal relationships influenced their development of moral judgments, moral motivation, and strength of character. Four graduating cadets, two men and two women, one each from the top and bottom of their class, participated in three, one-hour in-depth interviews.

This investigation had two primary questions. One, does the way cadets make meaning and understand authority, responsibility, and privilege differ when they are in relationship with officers, faculty, classmates or subordinates in three distinct contexts: the military, academic and co-curricular domains. The second area of interest was whether the application of a psychosocial developmental framework would help clarify the parallels between cadets’ levels of awareness about their own moral motivation and strength of character, and the quality of the meaning they make about their own interpersonal relationships.

Results revealed that these four cadets were at different developmental levels. The two cadets from the top of the class negotiated collaboratively in their relationships regardless of whether the relationship was with an officer, faculty member, classmate, or underclass. On the other hand, the two cadets from the bottom of their class quickly subordinated themselves to those in power. Results are generalized to civilian colleges.

Title of Dissertation: **Moving Beyond State-Centric Approaches to Transnational Security Threats**

Faculty: LCDR Joseph E. Vorbach III

Degree: Ph.D.

University: The Fletcher School of Law and Diplomacy, Tufts University

The traditional responses of governments to transnational challenges like drug trafficking, organized crime and terrorism do not align well with the transnational character of the threat. The research suggests that in the search for more effective approaches to these challenges, there is utility in looking at how the international system has responded to transnational challenges that do not bear the “security threat” label. This research looks closely at the international response to the transnational safety challenge posed by substandard transoceanic shipping and argues that the shipping safety regime might usefully inform better approaches to the drug trafficking challenge.

DEPARTMENT OF LEADERSHIP AND MANAGEMENT

CDR John B. McDermott, Department Head

a. Faculty Scholarship

Name of project: **The Liquidity Effects of S&P500 Revisions: An Empirical Analysis**
Faculty: CDR John B. McDermott with S. P. Hegde, University of Connecticut.

Publication: To be published in Journal of Financial Markets

Name of project: **The Liquidity Effects of the Introduction of Index Tracking Stocks on the Underlying Stocks: The Cases of Diamonds and Qubes**
Faculty: CDR John B. McDermott with S. P. Hegde, University of Connecticut.

Publication: Presented at Financial Management International Annual North American Meeting in Toronto in October 2001.

Name of project: **Firm Characteristics as Cross-sectional Determinants of Adverse Selection**
Faculty: CDR John B. McDermott with S. P. Hegde, University of Connecticut.

Publication: Presented at Financial Management International Annual European Meeting in London, England in June 2002.

Name of project: **Pollution Permits: A Discussion of Fundamentals**
Faculty: Professor David Weber

Publication: To be published in Journal of Economic Education

Name of project: **Accounting for the International Consequences of Domestic Policy Changes In the Introductory Macroeconomics Course: A Suggestion**
Faculty: Professor David Weber

Publication: Presented at 13th Annual Conference on Teaching Economics, Robert Morris College, Pittsburgh, PA, February 2002.

Name of project: **Product and Resource Markets: Points of Symmetry**
Faculty: Professor David Weber

Publication: Presented at Northeast Business and Economics Association Annual Conference, Hartford, CT, September 2001.

Name of project: **Economics Curriculum in Business Schools: Issues of Relevance to Business**
Faculty: Professor Philip Mathew

Publication: Presented at International Business Conference of the Society of Management, Las Vegas, NV, April 2002.

Name of project: **US Economic Policy and the Third World: 1980-1990**
Faculty: Professor Philip Mathew

Publication: Presented at 5th Annual Convention of the American Academy of Social and Behavioral Sciences, Las Vegas Nevada, February, 2002.

Name of project: **Active Learning in Economics: Lessons from a Macroeconomics Principles Course**
Faculty: Professor Philip Mathew

Publication: Presented at 13th Annual Conference on Teaching Economics, Robert Morris College, Pittsburgh, PA, February 2002.

Name of project: **Career Commitment: A Re-examination and Extensions.**
Faculty: Assistant Professor Laurel Goulet with P. Singh, University of New Haven.

Publication: To be published in Journal of Vocational Behavior (forthcoming)

Name of project: **Teaching Cohort Groups: An Outsider Looking In.**
Faculty: Assistant Professor Laurel Goulet with D. Finn, University of New Haven, and J. Neal, Center for Spirit at Work.

Publication: To be published in Journal of the Academy of Business Education

Name of project: **Creating the Enlightened Classroom: Bringing Your Passion into Your Teaching**
Faculty: Assistant Professor Laurel Goulet, CDR C. Corl, LT D. Singleterry, LCDR T. Ciampglio with D. Finn, University of New Haven; C. Giapponi, Fairfield University; M. Frank, Boehringer-Ingelheim Pharmaceuticals.

Publication: Proceedings of the 2002 Eastern Academy of Management Conference, New Haven, CT, May 2002.

Name of project: **Candyland: Sweetening the Exam Review Session**
Faculty: Assistant Professor Laurel Goulet with D. Finn, University of New Haven and C. Giapponi, Fairfield University.

Publication: Proceedings of the 2002 Eastern Academy of Management Conference, New Haven, CT, May 2002.

Name of project: **A Doctoral Student's Felt-Experience of a College of Business Administration's Strategic Planning Process**
Faculty: Assistant Professor Matthew Eriksen with S. Dugal, University of Rhode Island.

Publication: Presented at International Academy of Business Disciplines 14th Annual Meeting: Organizational Theory Track, Los Angeles, California, April 2002 and published in Business Research Yearbook: Global Perspectives, Volume 8, 2002.

Name of project: **(Re)Viewing Organizational Reputation in a Global Context**
Faculty: Assistant Professor Matthew Eriksen with S. Dugal, University of Rhode Island.

Publication: To be published in Journal of International Business and Entrepreneurship.

Name of project: **The Cost Manager's Role in Project Management**
Faculty: CDR J. Jennings with Diana Angelis, Ph.D. (CAM-I).

Publication: Presented at Consortium for Advanced Manufacturing-International, Cost Management Systems Program Quarterly Conference. Denver, CO, June 2002.

Name of project: **Internet Based Design: e-Design and e-Decision Making**
Faculty: CDR J. Jennings and CDR V. Wilczynski (Dept of Engineering).

Publication: Presented at American Society of Engineering Education Annual Conference, Albuquerque, NM, August 2001.

Name of project: **Peer Perspectives on My Leadership Style? Revisiting the Leadership Grid as a Feedback Instrument**
Faculty: LT D. Singleterry

Publication: Proceedings of the 2002 Eastern Academy of Management Conference, New Haven, CT, May 2002.

Name of project: **Intent to Invent**
Faculty: LCDR J. Heller

Publication: Proceedings of the 2002 Eastern Academy of Management Conference, New Haven, CT, May 2002.

Name of project: **Mugz Coffee Shop**
Faculty Name: LCDR J. Heller

Publication: Proceedings of the 2002 Eastern Academy of Management Conference, New Haven, CT, May 2002.

Name of project: **Is All Leadership The Same**
Faculty Name: LCDR T. Ciampaglio

Publication: To be published in US Naval Proceedings.

b. Cadet Scholarship

First Class Cadet Management Majors completed the consulting projects listed below during the Spring 2002. Each group provided a comprehensive final report and brief to their respective clients.

Project Name **National Coast Guard Museum Business Plan**
Cadets: 1/c Travis Emge, Phillip Ferranto, Lewis Motion, Winward Griffin,
 Lewis Motion, Marcus Ivery
Faculty Advisor LCDR Jonathan Heller
Client Coast Guard Headquarters
Development of Draft Business Plan for the proposed National Coast Guard Museum.

Project Name **CGA Management Department Survey**
Cadets 1/c Joshua Empen, Gino Sciortino, Benjamin Keffer, Katherine Bitel,
 Lindy Hinds
Faculty Advisor LCDR Richard Roncone
Client USCGA, Department of Leadership and Management
Development and deployment of an online survey of CGA Management Major graduates.

Project Name **Information Technology Plan**
Cadets 1/c Aaron Delano-Johnson, Karl Anforth, Jacob Gustafson, Aaron Mader, Corey
 Meeks
Faculty Advisor LT Anthony Bagisnski
Client Saint Bernard's High School
Development of a new Information Technology Plan for St. Bernard's High School.

Project Name **Community Relations Improvement**
Cadets 1/c Allison Zumwalt, Bien Decena, Vignette Kaltsas, Lyle Kessler
Faculty Advisor LT Darrel Singleterry
Client First Step
Development of a plan to improve the reputation of First Step within the New London community and increase the number of volunteers.

Project Name **Business Plan for Daycare/Kindergarten facility**
Cadets 1/c Lisa Tinker, Erin Long, Robert Cole, Molly Conlon
Faculty Advisor LT Darrel Singleterry
Client Drop-In Learning Center
Development of a Business Plan for proposed Daycare/Kindergarten Facility.

Project Name **Market and Feasibility Analysis**
Cadets 1/c Matthew Konon, David McCown, Robert Byrd, Herbert Law,
 Christopher Davis
Faculty Advisor CDR John Jennings
Client Connecticut River Museum
Conducted market and feasibility analyses for the proposed addition of a "floating classroom" to the Museum's "product line." In addition, provided recommendations regarding the Museum's decision to partner with a third-party vessel operator.

Project Name **Strategic Planning**
Cadets 1/c Vincent Jansen, Nathan Swardson, Alex Rabiychuk, Nicholas Worst
Faculty Advisor CDR Jennings
Client Meriden-Wallingford Society for the Handicapped
Developed a Strategic Plan.

Project Name **Business Process Analysis**
Cadets 1/c Scott Smith, Heather Gates, Christopher Culpepper,
 Joshua Rose, Jared Trusz, John McWhite
Faculty Advisor Professor Laurel Goulet
Client Meriden-Wallingford Society for the Handicapped
Identified opportunities to improve efficiency of Society's business processes.

Project Name **Market Analysis**
Cadets 1/c Jake Smith, Andrea Wachowiak, Hoon Park, Glenn Goetchius
Faculty Advisor Professor Laurel Goulet
Client Meriden-Wallingford Society for the Handicapped
Developed strategies and plans to increase awareness of Society's goals and the number of volunteers.

DEPARTMENT OF MATHEMATICS

Professor Janet McLeavey, Department Head

a. Faculty Scholarship

Name of Project: **Locating Targets Using Passive Sonar: Detecting Transient Signals Having Unknown but Contiguous Power Spectra**

Faculty: Professor Joe Wolcin

When a noisy waveform is sampled and input to a Discrete Fourier Transform (DFT), the resulting power samples are independent and exponentially distributed in most cases. If the sampled waveform is stationary or if its statistics change slowly with time, then the mean power in each DFT cell can be accurately estimated by averaging power samples from successive transform intervals. This allows the current data to be “normalized,” i.e. each power sample in the current timeframe can be divided by the mean, thereby converting each sample to an exponential random variable of unit mean. As we continue to monitor successive data timeframes, our objective is to determine if an additional noise source, i.e. a transient signal, has emerged in the data timeframe presently being examined. We assume that the structure of the transient signal, if present, is unknown, i.e. the number of frequency cells occupied by the signal, and the mean signal power levels in all signal cells are unknown quantities. We do, however, assume that the signal occupies a contiguous group of cells. Attempting to detect the presence of such a signal is equivalent to a mathematical hypothesis testing problem, where, under the null hypothesis, all data samples are exponential with unit mean (i.e. no transient is present), and under the alternative hypothesis, some contiguous subset of the data contains exponential samples having mean greater than one (i.e. transient signal is present). In this paper we derive various processors for detecting this type of transient signal, and we compare the detection performance of each candidate processor.

Publication: Presented at the Hawaii International Conference on Statistics. The paper will be published in the Proceedings of the Conference.

Name of Project: **Longitudinal Validation Study Utilizing the Classes of 1995 through 2005**

Faculty: Professor Ernest J Manfred and CDR George Rezendes

Mathematics departments throughout the United States are concerned with the large number of failures and dropouts in freshman calculus courses. Some studies put the figure as high as fifty percent. Currently considerable effort is being expended by educators and professional mathematics organizations to reverse this trend. It is clear that standardized test scores (aptitude) and high school grades are not a measure of calculus readiness. To alleviate the large number of failures, the Mathematics Department at the United States Coast Guard Academy developed a multiple linear regression model to predict grades in the first semester calculus course thereby identifying those students at risk. The model uses available data on incoming cadets as one part of a total placement procedure. Information gleaned from such procedures reduces errors stemming from underestimating or overestimating a student’s capabilities in calculus courses. The literature is replete with studies that predict term or cumulative grade point averages. Very little research has been done to predict performance in individual courses. The regression model includes standardized test scores, high school rank, types of mathematics courses taken in high school; three achievement related exams and several other independent variables. A longitudinal analysis of the past eleven years of using the model is presented to determine how well the model predicts and to observe trends of the independent variables.

Publication: Presented at the Hawaii International Conference on Statistics. The paper will be published in the Proceedings of the Conference.

Name of Project: **“Hands-On Visual Basic” text & “Class Notes” (Ed. 3)**

Faculty: LT Kye Gilder

A hands-on Visual Basic programming course textbook was developed for the required ORCA course. The text and the associated class notes, projects, and code samples were completed.

Publication: Academy course use only.

Name of Project: **Alternative Confidence Intervals for the Assessment of Bioequivalence in Four-Period Crossover Design**

Faculty: LT Kye Gilder

Sponsor: Pfizer, Inc.

Bioequivalence studies are conducted to demonstrate bioavailability of the active ingredients in different drug formulations. The U.S. FDA requires pharmaceutical companies to show bioequivalence between different formulations or generic companies to show bioequivalence between generic drugs and brand named drugs. Project was concerned with developing a “better” (more accurate) statistical method than the one required by the FDA.

Name of Project: **Uniforms Only Gibbs Sampling Using Nested Slice Samplers**

Faculty: LT Kevin Mahoney

The use of auxiliary uniform random variables within a Gibbs Sampler was shown to be useful in a variety of applications by Damien, Wakefield, and Walker (1999). This construction, also known as the “slice” sampler because of its use of conditional distributions, can result in easier implementation and faster computation times making it a desirable alternative to “standard” MCMC methods. An important extension of this algorithm occurs in certain situations where problems may be parameterized to allow sampling from only uniform distributions rather than several uniforms and one non-uniform truncated density. The advantage of this is the speed and ease of sampling only from uniform densities. Several problems will be examined including sampling within a Poisson regression model, a Bernoulli logistic model, and from truncated Gamma and Normal distributions.

Publication: Presented at the Hawaii International Conference on Statistics and published as Coast Guard Center for Advanced Studies Report # 05-01.

Name of Project: **New licenses keep historic elements in their design**

Faculty: CAPT Robert S. Bates

Publication: To be published in *Professional Mariner* (June/July 2002)

Name of Project: **Multi Domain WENO Finite Difference Method with Interpolation at Sub-domain Interfaces**

Faculty: LCDR Kurt Sebastian

High order finite difference WENO (Weighted Essentially Non-Oscillatory) methods have the advantage of simpler coding and smaller computational cost for multi-dimensional problems, compared with finite volume WENO methods of the same order of accuracy. However a main restriction is that conservative finite difference methods of third and higher order of accuracy can only be used on uniform rectangular or smooth curvilinear meshes. In order to overcome this difficulty, in this paper we develop a multi-domain high order WENO finite difference method which uses an interpolation procedure at the sub-domain interfaces. A simple Lagrange interpolation procedure is implemented and compared to a WENO interpolation procedure. Extensive numerical examples are shown to indicate the effectiveness of each procedure, including the measurement of conservation errors, orders of accuracy, essentially non-oscillatory properties at the domain interfaces, and robustness for problems containing strong shocks and complex geometry.

Our numerical experiments have shown that the simple and efficient Lagrange interpolation suffices for the sub-domain interface treatment in the multi-domain WENO finite difference method, to retain essential conservation, full high order of accuracy, essentially non-oscillatory properties at the domain interfaces even for strong shocks, and robustness for problems containing strong shocks and complex geometry. The method developed in this paper can be used to solve problems in relatively complex geometry at a much smaller CPU cost than the finite volume version of the same method for the same accuracy.

Publication: To be published in the Journal of Scientific Computing.

b. Cadet Scholarship:

Name of Project: Marine Safety Center Workload Management Analysis
 Cadets: 1/c Boesch, 1/c Groves, and 1/c McCormack

Name of Project: Systems Approach to Mathematics Department Staffing Requirements
 Cadets: 1/c Anderson, 1/c Cochet, 1/c Owens, and 1/c Switzer

Name of Project: An Analysis of Skills Based Assignments and Its Effects on the Enlisted Work Force
 Cadets: 1/c Bartlett, 1/c Goff, and 1/c Krug

Name of Project: Analysis of Discrepant Aids to Navigation in the Coast Guard
 Cadets: 1/c Colebourn, 1/c Corbett, 1/c Stark, and 1/c Trocchio

Name of Project: Indicators of an Individual's Propensity to Select a Technical Major
 Cadets: 1/c Armstrong, 1/c Cheung, 1/c Harris, and 1/c Wolfe

Faculty Advisors: Dr. Janet McLeavey, Dr. Kathy Krystinik, CAPT Mark Case, and CDR George Rezendes.

Description of Project: Operations Analysis course projects (senior capstone).

c. Theses or Dissertations:

Title of Thesis: **Determining the Proper Size of the United States Coast Guard General Detail**
 Faculty: LT Lara A. Anderson
 Degree: Masters
 University: Purdue University

This project used system dynamics to model and project the required size of the Coast Guard's General Detail. The general detail is the set of billets that are used as a buffer to ensure that all operational jobs are filled all the time. Three alternate policies were analyzed to determine their efficacy at minimizing the numbers of billets while maximizing the time those billets are filled. A determination of the appropriate policy was made by balancing the numerically optimal solution with practical implementation difficulties.

DEPARTMENT OF SCIENCE

Professor Richard Christman, Department Head

Chemistry Section

CAPT Richard Gaines, Section Chief

a. Faculty Scholarship

Name of Project: **Methods for Improved Detection of Accelerants in Fire Debris**
Faculty: Associate Professor Glenn Frysinger and CAPT Richard Gaines
Sponsor: National Institutes for Justice/Department of Justice and the Bureau of Alcohol, Tobacco and Firearms

The detection of arson accelerant fingerprints in complex background of chemicals generated by the event.

Publication: "Forensic Analysis of Ignitable Liquids in Fire Debris by Comprehensive Two-Dimensional Gas Chromatography" published in Journal of Forensic Science; "Forensic Analysis of Ignitable Liquids in Fire Debris by Comprehensive Two-Dimensional Gas Chromatography" presented at the 25th International Symposium on Capillary Chromatography and Electrophoresis, Riva Del Garda, Italy.

Name of Project: **Performance Testing, Evaluation and Optimization of a Dual-Jet Modulator for GCxGC**

Faculty: CAPT Richard Gaines, Associate Professor Glenn Frysinger

Sponsor: Lawrence Livermore National Laboratory

A detailed understanding of the modulator functionality and the variables that affect modulator performance will help facilitate the application of this new technology to various LLNL projects.

Name of Project: **Organic Geochemistry and Environmental Forensics Applications of GCxGC**

Faculty: Associate Professor Glenn Frysinger, CAPT Richard Gaines

Sponsor: Woods Hole Oceanographic Institute

GCxGC is used to separate compounds of interest from complex environmental samples.

Publications: "GCxGC-A New Tool For Environmental Forensics" published in Environmental Forensics; "Resolving the Unresolved Complex Mixture in Petroleum Contaminated Sediments with Comprehensive Two-Dimensional Gas Chromatography" the 25th International Symposium on Capillary Chromatography and Electrophoresis, Riva Del Garda, Italy.

b. Cadet Scholarship:

Name of Project: **Teaching Assistant in General Chemistry Lab**

Cadet name: 1/C Lance Leone

Faculty Advisor: LCDR Cummins

Cadet professional development in teaching methods.

c. Theses or Dissertations:

Title of Thesis: **A Cryo-Thermal Modulator for Comprehensive Two-Dimensional gas Chromatography**
 Faculty name: LT Robert Keister
 Degree: Masters
 University: University of Connecticut
 Design, construction, testing and evaluation of an improved thermal modulator for GCxGC applications.

Title of Dissertation: **Synthesis and Investigation of Square Planar Bis(ferrocenyl) Dithiolene Complexes of Nickel, Palladium, and Platinum: Control of Near-Infrared Absorption and Other Properties by Ligand Modification**

Faculty: LCDR Richard W. Sanders
 Degree: Doctor of Philosophy in Chemistry
 University: University of Connecticut

Fifteen ferrocenyl-substituted d^8 transition-metal dithiolenes were synthesized to investigate the chemical and physical properties of this class of square-planar complexes. The synthetic methods developed afforded precise control over the near-infrared maximum absorption wavelength, solubility, and other properties of these dyes. The nickel, palladium, and platinum bis(ferrocenyl) dithiolenes displayed a range of maximum absorption wavelength from 1007 nm to 1737 nm with very low absorbance in the visible region of the spectrum. Three dyes were found to absorb at longer wavelengths than any other dithiolene complex, and the 1737 nm value represents the lowest-energy absorption known for any dye. In addition, these complexes were found to be air-stable and did not suffer oxidative decomposition associated with other low-energy absorbers.

It was shown that absorption frequency maxima varied with the degree of rotational freedom and donor strength of the ferrocenyl substituents, although peak intensities were not greatly affected. The absorption frequency of a secondary electronic transition, common to this class of ferrocenyl dithiolenes and located at the edge of the visible region, was found to be predominantly influenced by inductive effects rather than coplanarity or extension of a delocalized p -system.

Dyes were functionalized so that their absorption behavior could be studied in both polar and nonpolar solvents, ranging from dimethylformamide and water (pH 3 to 9) to methylene chloride and hexane. Such functionalization has expanded the potential for use of these dithiolenes. One dye has been combined with an immunoconjugate molecule to form a prototypical photodynamic therapeutic agent. The demonstrated antitumor activity of this new material results in large part from the response to near-infrared radiation of the (bis)ferrocenyl dithiolene complex.

Marine Science Section

Associate Professor Linda Huzzey, Section Chief

a. Faculty Scholarship

Name of Project: **A Characterization of North Atlantic STMW Layer Climatology Using World Ocean Atlas 1994 Data**

Faculty: CDR Michael Alfultis

Subtropical Mode Water (STMW) is a water mass formed in winter by convective mixing on the equatorward side of western boundary currents in the subtropical gyres. After the return of the seasonal stratification in spring, it is found at the stratification minimum between the seasonal and main pycnoclines. By characterizing STMW primarily at the density gradient minimum, previous studies were limited in their ability to describe STMW properties over large temporal and spatial scales. Rather than using a density-based characterization, the North Atlantic STMW layer was identified here by its much smaller temperature gradient relative to the more stratified seasonal and main thermocline, its temperature, and its large thickness. Comparisons between this method and identifying the STMW layer using a density-based (i.e., potential vorticity) criteria indicate that this method successfully identifies the STMW layer as the remnant of the previous winter's convective

mixing. By using this temperature-based characterization, this study was able to develop a climatology using the large number of XBT's deployed between 1968 and 1988, and contained in the World Ocean Atlas 1994 historical hydrographic database, and use this climatology to examine STMW properties on large spatial and long temporal scales. From this climatology, the STMW layer which is the remnant of the previous winter's convective activity is typically found between 175 and 450 m, has an average temperature near 18°C, and has a mean temperature gradient of 0.5°C per 100 m. Comparisons of the STMW temperature, thickness, and temperature gradient characteristics in this climatology agree with other observations of the North Atlantic STMW layer. Three different characterizations were used to assess the degree of convective renewal of the STMW layer during the 1968-1988 winters. Two characterizations were based on comparing the winter mixed layer properties to the STMW layer properties in the previous fall, while the third characterization involves comparing the temperature gradient through the STMW layer in the spring to the STMW layer temperature gradient in the previous fall. Based on these characterizations, there was considerable spatial and temporal variability in the renewal of the STMW layer's vertical homogeneity from 1968 to 1988. Basin-wide renewal occurred in 1969, 1970, 1977, 1978, 1981, and 1985, with more localized renewal, usually east of 55°W, in the other years. While STMW is nearly vertically homogeneous immediately after renewal, the temperature gradient through the layer increases with time following renewal. The annual rate of increase in the temperature gradient in the year following renewal is $\sim 5\text{-}6 \times 10^{-4}$ °C per 100m per day, while the interannual rate of increase is $\sim 2.0 \times 10^{-4}$ °C per 100m per day following winters with no renewal of the STMW layer.

Publications: A Characterization of North Atlantic STMW Layer Climatology Using World Ocean Atlas 1994 Data, M. Alfultis and P. Cornillon, *Journal of Oceanic and Atmospheric Technology*, **18**, 2021-2037, December 2001, Annual and Interannual Changes in the North Atlantic STMW Layer Properties, M. Alfultis and P. Cornillon, *Journal of Physical Oceanography*, **31**, 2066-2086, August 2001.

Name of Project: **Studying Earth's Environment from Space (SEES): Development of Inquiry-Based Classroom and Lab Activities from Satellite Data**

Faculty: CDR Michael A. Alfultis

Sponsor: NASA

Satellite images of the Earth's atmosphere, hydrosphere, lithosphere, and biosphere have proven to be valuable tools in studying the complexity of the Earth's environmental systems. Rarely, however, do students have the opportunity to access and USE such data for scientific inquiry and to learn about the Earth's environmental systems. Educators find incorporating satellite data into their science curriculum difficult due to the technical complexity of the data, the computer hardware/software requirements to process the data, the diverse ocean/atmosphere processes illustrated by the satellite data, and little time during the academic year available to develop curriculum. The goal of this NASA-funded project is to increase the use of satellite data in science classrooms by developing classroom materials linked to inquiry-based student exercises. Studying Earth's Environment from Space (SEES) consists of four modules on the topics of Stratospheric Ozone, Land Vegetation Cover, Ocean and Atmospheric Interactions and Polar Sea Ice Processes. Each module consists of scientific background information for classroom presentations and lab exercises. This project was completed with Elizabeth Smith of Old Dominion University and Carla Evans of NASA Goddard's Earth Science Scientific and Educational Endeavors group (SEE) group, and was awarded NASA Certification as an official NASA Educational Product.

Publication: All SEES materials are available at the following Web site: see.gsfc.nasa.gov/edu/SEES/
Presentation on SEES Project was made at the National Science Teacher's Association's (NSTA) National Convention in San Diego, CA, in March 2002.

Name of Project: **Circulation at the entrance to Narragansett Bay**

Faculty: Associate Professor Linda M. Huzzey

Sponsor: Rhode Island Sea Grant; URI Graduate School of Oceanography

This three-year project utilized field measurements of the hydrography and circulation at the entrance to Narragansett Bay in order to improve the understanding and quantification of exchange between Narragansett Bay and the coastal ocean. Detailed knowledge of this exchange is essential to developing accurate water quality models for the bay. Data was collected using a boat mounted acoustic doppler current profiler (ADCP)

combined with salinity and temperature profiles. Study was conducted in conjunction with Dr. Chris Kincaid and Dr. Rob Pockalny of the Graduate School of Oceanography at the University of Rhode Island.

Publication: Circulation and Hydrography at the entrance to Narragansett Bay, C. Kincaid, R. A. Pockalny, L. M. Huzzey, submitted to J. of Geophysical Research.

Name of Project: **Cognitive Development Through A Marine Science Curriculum**

Faculty: Associate Professor Linda M. Huzzey and CDR Mike A. Alfultis

The curriculum of the Marine and Environmental Sciences major at CGA includes a range of environmental science, oceanography and chemistry courses whose content is all centered on a marine environmental theme. However, in addition to imparting a certain set of knowledge, the curriculum is also designed to promote the cognitive development of the students. The goal is to graduate students who not only have a good knowledge of the marine environment, but also have excellent problem solving skills that can be applied to real world settings. Students enter the Marine and Environmental Sciences program as sophomores and follow a similar sequence of courses. The cognitive skills emphasized throughout are critical thinking, communications and quantitative analysis. The courses are designed such that these skills are progressively developed as the students move through the curriculum. A variety of learning exercises and experiences are used foster this cognitive growth. The courses and skill development are combined into a “developmental matrix.” This developmental matrix approach has been developed over several years and has proved to provide an excellent framework for curriculum design and assessment.

Publication: Presented at the International Estuarine Research Federation Conference, Tampa Bay, Florida, November 2001.

Name of Project: **Anthropogenic Activities Associated with the Status of Salmon Stocks in Pacific Northwest Watersheds**

Faculty: Assistant Professor Karina L. Mrakovcich

The purpose of this study was to verify statistical associations between the status of salmon stocks and human impacts on salmon watersheds. Hypotheses were: 1) Anthropogenic variables are significantly associated with the status of salmon stocks (either positively or negatively depending on the variable), 2) Species/races that spend more time in fresh water are more significantly associated with watershed variables, 3) Ecoregions characterized by favorable climate, soils, vegetation and less human development are associated with healthier salmon. Watersheds in the Pacific Northwest were coded for the status of salmon and anthropogenic variables including land use, dams, hatcheries and human organizations formed around the watershed. Watersheds were also characterized into ecoregions and later into two distinct regions: coast and Columbia Basin. Results indicated that the number of dams below a watershed was the variable most consistently associated with the unhealthy status of salmon stocks. Other anthropogenic variables were more species specific. Results of this study supported the importance of watershed health in saving salmon stocks.

Publications: Presented at Southern New England Chapter of the American Fisheries Society – Oral Presentation in Massachusetts, June 2001, and American Fisheries Society annual conference – Poster presentation in Phoenix, Arizona, August 2001.

Name of Project: **Creating Inquiry-Based Research Opportunities in a Marine Science Curriculum**

Faculty: LT Sean Schenk

Student enthusiasm, interest, and retention of applied science concepts increase when “chalkboard knowledge” is complemented by a structured process of individual and peer discovery. The Coast Guard Academy MES curriculum relies heavily on inquiry-based activities. Students develop into independent and critical thinkers when project complexity increases incrementally as the level of instructor support decreases. Project complexity is determined by the kind of data sets and computer software tools used by the students. It is also a function of the degree of freedom students have to investigate the subject of the activity. The data sets used in these activities range from historical oceanographic data; to student collected, estuarine, hydrographic and

nutrient data; to global, decadal satellite data sets. The inquiry-based activities using these data and software are then sequenced to develop a toolbox of scientific skills over a three-year curriculum.

Publication: Presented at National Science Teacher Assoc. Conference (Mar 28-31, San Diego, CA).

Name of Project: **An Acre and Hour: Effects of Land-use on Watersheds**

Faculty: Assistant Professor Sam C. Wainright

Sponsor: National Science Foundation

This 3-year research project is to determine the environmental impact different land use patterns on the ecology of streams in Pennsylvania. The research is funded by a grant from the National Science Foundation to Dr. Claire Welty and her colleagues at Drexel University. Prof. Wainright provides the stable isotopic analysis of plant and animal samples collected from streams within watersheds of differing land-use patterns, and interpretation of the isotope data.

Name of Project: **Assimilation of Carbon and Nitrogen from Flowers by Insects**

Faculty: Assistant Professor Sam C. Wainright

Sponsor: Bedding Plants Foundation, Inc., NJ Agricultural Experiment Station

This research project concerned the nutritional value of pollen-derived nutrients vs. insect prey by a predatory insect. We “labeled” the pollen with a chemical tracer, and followed the path of that tracer into the insect’s body tissues. The project was conducted in collaboration with Dr. Joseph Patt (The Nature Conservancy) and the research has been completed and a publication is in preparation.

Name of Project: **Food Web Support and Trophic Position of Fundulus heteroclitus in New Jersey Marshes**

Faculty: Assistant Professor Sam C. Wainright

Sponsor: Marsh Ecology Research Program, Public Service Energy and Gas of New Jersey

This research project concerns the determination of the base of the food chain in salt marshes in southern New Jersey. We are using the common marsh fish, Fundulus heteroclitus, as a test animal. Muscle tissue samples are analyzed for stable isotope ratios, which are in turn used to chemically determine the diet of this fish. We are comparing the diet of Fundulus in natural marshes, in those invaded by the plant Phragmites australis, and in Phragmites-dominated marshes that have been restored to their original state after invasion. This research was conducted in collaboration with Drs. Carolyn Currin (National Oceanic and Atmospheric Administration), Michael Weinstein (NJ Marine Sciences Consortium) and Dr. Kenneth Able (Rutgers University). The project has been completed and a publication is in preparation.

Name of Project: **Turnover rates of Carbon and Nitrogen in Winter Flounder**

Faculty: Assistant Professor Sam C. Wainright

Sponsor: Cooperative Marine Education and Research Program, NOAA

This research project concerned the use of stable isotope ratios as a means of assessing the diet of the common estuarine fish, winter flounder. In a laboratory experiment, we “labeled” the food of the fish and determined the length of time required for the label to become apparent in the fish tissues. This research might have application in field research where investigators require a knowledge of how long an animal has been feeding on its present diet. The project was conducted in collaboration with Drs. Chris Chambers and David Witting (NOAA’s National Marine Fisheries Service, Sandy Hook, NJ) and Mr. Keith Bosley NOAA’s National Marine Fisheries Service, Newport, Oregon). The research has been completed and a publication is in preparation.

b. Cadet Scholarship

Name of Project: **Computer Visualizations of the Indian Ocean Summer and Winter Monsoons**

Cadets: 1/c Matt Baker and 1/c Seth Pennington

Faculty Advisor: CDR Michael A. Alfultis

The Asian monsoon is a very significant weather pattern that has a considerable effect on the weather patterns in the Indian Ocean. During the winter months, the winds come from the northeast, bringing dry conditions to the Indian peninsula, while in the summer months, the winds come from the southwest, bringing heavy precipitation to India. This monsoonal weather pattern also has a considerable impact on the oceanographic conditions of the Indian Ocean – causing lower sea surface heights, cooler sea surface temperatures, and increasing primary production in the summer while causing the opposite in the winter.

The existence of the Asian summer and winter monsoons in the Indian Ocean has been known for many years. Ancient merchants originally documented these winds to aid in their quick movement through the trade routes around India and Asia. Today, satellites in space give researchers the advantage of total area coverage three hundred sixty five days a year. Computer graphics and animation allow researchers to create new and powerful visualizations of scientific data. This study is an exercise in using computer resources to create visualizations of satellite-based oceanographic data. Physical oceanography data from satellites is analyzed using computer software to produce unique visualizations of the atmosphere-ocean interactions in the Indian Ocean associated with the Asian monsoon system. These visualizations will be useful as classroom demonstrations and discussion starters in several courses in the Marine and Environmental Sciences major.

Name of Project: **Analysis of Heavy Metal Concentrations in Smith Cove by Inductively Coupled Plasma-Atomic Emission Spectroscopy**

Cadet: 1/c Kellee Gaffey and 1/c Chris Nolan

Faculty Advisor: LT Sean Schenk

Heavy metal concentrations in the sediment of a cove can provide a wealth of information about the environmental quality of the cove and indicate some possible sources of pollution. Twenty-nine grab samples were collected from Smith Cove, located on the west bank of the Thames River, 2.2nm north of Fishers Island Sound. The samples were digested using EPA method 3051 (*Microwave Assisted Acid Digestion of Sediments, Sludges, Soils and Oils*) and analyzed using EPA method 6010B (*Inductively Coupled Plasma-Atomic Emission Spectrometry*) to determine the concentrations of four metals: Cd, Cu, Pb and Zn in Smith Cove. Concentrations of Cu ranged from 24.4-99.2 ppm, Pb concentrations ranged from 8.01-83.8 ppm and Zn concentrations ranged from 24.1-137.0, which are typical values for the region, and are considered to be low levels according to the New England River Basin Commission (NERBC). Cd concentrations are above normal for the region, ranging from 0.67-5.51 ppm, and are considered to be at moderate levels for the region.

Name of Project: **Exploring ARAC Support of U.S. Coast Guard Planning & Response Capability**

Cadet: 1/c Matt Baker

Faculty Advisor: LT Sean Schenk

ARAC is a powerful modeling system that can quickly predict the consequences of atmospheric releases of hazardous material. The US Coast Guard, responsible for responding to hazardous material spills in the marine environment, relies on other agencies for atmospheric modeling support. The ARAC system could provide the USCG with a powerful yet easy resource that could make planning and response operations more effective. Study was conducted as part of an internship with Lawrence Livermore National Laboratories in summer 2001.

Name of Project: **Characteristics of a Shallow Cove in the Thames River Estuary**
 Cadet Name: 1/c Chris Nolan
 Faculty Advisor: Associate Professor Linda Huzzey

Smith Cove is blocked by a railroad right-of-way, reducing tidal exchange area. Corresponding increased velocity has scoured a channel through the middle of the cove, creating a situation where high sand fraction sediment is present spatially between areas of silt/clay sediment towards the banks. Flushing time varies between 3 and 8 days, and along with salinity and temperature, is highly modified by certain wind events. Heavy metal concentrations vary geographically, and follow the general pattern of increasing concentration further from the channel. Most metal concentrations are classified “low” according to the NERBC. Flow under the two main entrances to Smith Cove varies little in the across channel direction, and flow along the channel approaches 45 cm/sec. The present conditions in Smith Cove are discussed.

c. Thesis

Thesis Title: **Using Stream Function Coordinates to study the Circulation and Water Masses of the North Pacific**
 Faculty: LT Byron D. Willeford
 Degree: Master of Science in Oceanography
 University: University of Rhode Island, Graduate School of Oceanography

The spatial and temporal variability in the Northwestern Pacific (NWP), the evolution of water masses and fronts originating in the NWP, and the mean circulation of the North Pacific are examined in stream function coordinates parameterized by geopotential height, σ . North Pacific Intermediate Water (NPIW) is formed as a salinity minimum in the NWP at the Polar/Subarctic Front (PF/SAF) between 145°-150°E from November through April by subduction of cold, fresh subpolar water under warm, salty water of the Mixed Water Region (MWR). Kuroshio Warm Core Rings (WCRs) in the northern portion of the MWR serve as another process for the formation of NPIW and the associated salinity minimum. NPIW spreads throughout the subtropical gyre and the northern region of the NWP by mixing across the Kuroshio Extension Front (KEF) and the SAF east of 150°E. The Potential Vorticity, PV , contours $1.5-3 \times 10^{-10} \text{m}^{-1} \text{s}^{-1}$ parallel the axis of the salinity minimum within NPIW and serve as a tracer for the formation and spreading of NPIW throughout the NWP. The $4 \times 10^{-10} \text{m}^{-1} \text{s}^{-1}$ PV contour identifies the base of the seasonal thermocline in the NWP. As the fronts of the North Pacific separate geographically, their positions in stream function space remain nearly fixed. As a result, large scale, seemingly subtle, changes in the water column between these fronts in geographic space become evident in stream function space.

This study employs the Gravest Empirical Mode (GEM) technique. The technique utilizes a cubic spline under tension to smooth horizontally over historic, non-synoptic data organized by geopotential height. This procedure projects the data into stream function coordinates and produces a two dimensional “empirical mode” field which is “gravest” in that it results from full water column profiles and captures a dominant fraction of the variance. For this study, the technique has been expanded to include fields of σ_θ and PV in addition to T and S , all parameterized as functions of (p, σ) . Furthermore, the fields of T , S , p , and PV have been re-gridded as functions of (σ_θ, σ) . The method of determining and removing the annual signal in T and S is an improvement over previous GEM studies, and provides a simple tool for creating monthly property fields in stream function space.

Physics Section

CAPT Robert Fuller, Section Chief

a. Faculty Scholarship

Name of project: **Astronomy Publications**

Faculty: LCDR James R Dire

Wrote a monthly Astronomy column titled "What's up" published in the New London, *The Day* newspaper.

Name of project: **Physics Course Redesign**

Faculty: LT Scott Smithers, Associate Professor Richard Paolino,
Ms Michele Fitzpatrick

This project seeks to improve student learning and comprehension of Physics by redesigning the course format to address a broader range of learning styles. Technology inside and outside the classroom is an enabler to this change. The redesign is being modeled after successful changes made at Rensselaer Polytechnic Institute and North Carolina State University, among others.

b. Cadet Scholarship

Name of project: **Solar Eclipse Research**

Cadet: 1/c Jennifer M. Imbres

Faculty advisor: LCDR James R. Dire

Sponsor: Class of 1947 Challenge and Prof. James Huddle, USNA Department of Physics

Conducted research during the June 21, 2001 Total Solar Eclipse in Zambia, Africa as part of a cadet summer internship.