CARL ALLEN HAGER, Ph.D.

Instructor - Environmental Studies and Natural Sciences / Global Studies Residential Academic Programs (RAPs)
Assistant Professor Adjunct - Atmospheric and Oceanic (ATOC) Sciences Department
University of Colorado Boulder

EDUCATION

Doctor of Philosophy (Ph.D.) Physical Oceanography, Naval Postgraduate School, Monterey, CA
Master of Science (M.Sc.) Physical Oceanography, Naval Postgraduate School, Monterey, CA
Bachelor of Science (B.Sc.) Physical Science, United States Naval Academy, Annapolis, MD

RESEARCH

- Research lead for Passive Acoustic Monitoring (PAM) during Virginia Capes (VACAPES) Range Complex underwater detonation experiment. PAM and transmission loss measurements were conducted during mine neutralization exercises. Additional collaborators included: Anu Kumar, Mandy Shoemaker, Cara Hotchkin, Deanna Rees, Joel Bell, Schott Chappell, Sara Rider and Taura Huxley-Nelson, *Naval Facilities Engineering Command, Norfolk, VA*, Dan Engelhaupt, *HDR Environmental, Operations and Construction, Inc.,* Peter Dahl, Alex Soloway, Dara Farrell and David Dall'Osto, *University of Washington,* Jene Nissen, Ron Filipowicz and Dave MacDuffee, *U.S. Fleet Forces, Atlantic*. (September 2012)

- Collaborator for Ecological Acoustic Recorder (EAR) deployments at VACAPES. Additional collaborators included Anu Kumar and Mandy Shoemaker, *Naval Facilities Engineering Command, Norfolk, VA*, Dan Engelhaupt, *HDR Environmental, Operations and Construction, Inc.,* Mark Lammers and Lee Shannon, *Hawaii Institute of Marine Biology.* (July 2012)

- Collaborator for "Transmission characteristics of Arctic pinniped vocalizations through ice" – BROMEX 2012. A low amplitude propagation experiment was conducted to measure the transmission characteristics of water borne Arctic pinniped vocalizations. Experiment design: Samuel Denes (Doctoral Student, *Graduate Program in Acoustics, Penn State University).* (March 2012)

- Chief Scientist for VACAPES Marine Mammal Density (Visual and Acoustic) Surveys. Monitoring was conducted during five training events in the Virginia Capes (VACAPES) Range Complex. Passive acoustic monitoring methods ranged from a single hydrophone to an array of drifting sonobuoys monitored in real time. Approximately 54 hours of acoustic data were collected before, during, and after the 5 events. Behavioral changes were evaluated based on analysis of vocalizations detected before, during, and after explosions and concurrent data from visual sightings. For time periods with both visual and acoustic monitoring data, detection methods were compared to evaluate effectiveness. Additional collaborators included: Anu Kumar, Mandy Shoemaker, Cara Hotchkin, Deanna Rees, Joel Bell, Sara Rider and Taura Huxley-Nelson, *Naval Facilities Engineering Command, Norfolk, VA*, Jene Nissen, Ron Filipowicz and Dave MacDuffee, *U.S. Fleet Forces, Atlantic*. (August / September 2009, 2010 and 2011)

- Chief Scientist for *RV Sproul* Acoustic Playback Experiment and Marine Mammal Survey, SOAR Underwater Acoustic Range, San Clemente Island, CA. This methodology replicated the August 2004 experiment. (August 2005)

- Chief Scientist for *RV Pt Sur* Acoustic Playback Experiment and Marine Mammal Survey, SOAR Underwater Acoustic Range, San Clemente Island, CA. A series of 10 to 20 kHz, frequency-sweeping

signals synthesizing whistles of vocalizing Odontocetes was transmitted from a J-9 sound projector suspended from the *Research Vessel Pt Sur* while over the Range. The transmissions were recorded by a group of seven near-bottom hydrophones of the Range. (August 2004)

- Co-Principal Investigator for "USNA Polar Science Program (PSP) NAICEX 2013". Deployed an autonomous, under-ice acoustic sensor off of Barrow, Alaska designed to transmit near real-time, 1/3 octave band ambient noise levels via satellite. Additional collaborators included: Son Nghiem, *NASA Jet Propulsion Laboratory*, *California Institute of Technology*, Pablo Clemente G Colón, Sean Helfrich and Bethany McDonald, *National Ice Center*, Todd Valentic, *SRI International*, Cathy Geiger and Tracy DeLiberty, *University of Delaware*, Ignatius Rigor, *University of Washington.* (March 2013)

- Woods, J., **Hager, C**., Valentic, T., Rigor, I., Clemente-Colon, P., "Establishment of an active, field research program in Polar Science that will greatly enhance Midshipman education and research, as well as introduce future Naval Officers to the Arctic Environment", *Office of Naval Research*, 2 year $50K Grant. (January 2013)

- Research Lead (Acoustic) for "Implications of Arctic sea ice reduction on Tropospheric Bromine, Ozone, and Mercury Chemical Processes, Transport, and Distribution" – BROMEX 2012. Collected under-ice acoustic data in order to characterize ice lead ruptures and collisions during the Chuckchi Sea polar spring. Additional collaborators listed in Publications section. (March 2012)

CONSULTANT / CONTRIBUTING SCIENTIST (HDR)

- $75M Marine Species Monitoring Contract (U.S. Navy). Research tasks include aerial and shipboard surveys, passive acoustic data collection, biopsy sampling and species-specific behavioral research in the Navy's training areas in the Northwest Atlantic Ocean, Caribbean Sea, Gulf of Mexico and Pacific Ocean. All tasks will be performed on protected species and habitat as mandated by the Endangered Species Act, Marine Mammal Protection Act, Magnuson-Stevens Act and other related regulations. Period of Performance: FY 2015-2020.

- $3M Real-Time Opportunity for Development Environmental Observations (RODEO) (Bureau of Ocean Energy Management). The objective of this study is to acquire real-time observations of the construction and initial operation of wind facilities (off shore Block Island, Rhode Island) to aid the evaluation of environmental effects of future facilities. Research tasks include assessment of sound environment during construction, evaluation of visual activities during and after construction, evaluation of air quality emission sources from construction activities, evaluation of sediment disturbance and recovery, investigating the effects of mitigating / abatement measures and evaluation of monitoring technologies or techniques. Period of Performance: FY 2015-2020.

- $15M Passive Acoustic Monitoring (PAM) for the Northern Gulf of Mexico (Bureau of Ocean Energy Management). The objective of this project is to establish a long-term passive acoustic monitoring program using moored acoustic recorders at permanent stations throughout the GOM. The program will establish a "baseline" for ambient noise in the GOM against which to judge potential future noise impacts from BOEM/BSEE activities as well as characterize the sound budget from other kinds of noise already occurring in the GOM (e.g. shipping). In addition, acoustic recorders will be able to detect vocalizing marine mammals, providing both spatial and temporal information about cetacean species in the GOM.

PUBLICATIONS / PRESENTATIONS

- Katya Hafich, Wynn Martens, Hannah Fletcher, Barbara MacFerrin, Deb Morrison, Judith Stone, Mary Claire Collins, Michael Chastain, **Carl Hager**, Eileen Duncan, Cindy Gay, J.D. Kurz, Cheryl Manning, "Climate Literacy from the Plains to the Peaks: Challenges in Teaching Climate in Colorado Classrooms", *American Geophysical Union Fall Meeting*, San Francisco, CA, 14-18 December 2015. (Oral Presentation)

- Cara Hotchkin, Mandy Shoemaker, Anurag Kumar, Jacqueline Bort, **Carl Hager**, Dave MacDuffee, Jene Nissen and Ron Filipowicz, "Passive acoustic monitoring for marine mammals during Navy explosives training events off the coast of Virginia Beach, VA", *5th International Meeting on the Effects of Sound in the Ocean on Marine Mammals (ESOMM-2014)*, Amsterdam, the Netherlands, 7-12 September 2014. (Oral Presentation)

- **Carl Hager**, Keith Pommerenck, Michael Richlen, Jenn Latusek-Nabholz, Randy Gallien, D. Spontak, "Assessing Pile Driving Sound Impacts on Gulf Sturgeon in the Florida Panhandle", *5th International Meeting on the Effects of Sound in the Ocean on Marine Mammals (ESOMM-2014*), Amsterdam, the Netherlands, 7-12 September 2014. (Accepted Poster)

- Cara Hotchkin, Mandy Shoemaker, Anurag Kumar, **Carl Hager**, Dave MacDuffee, Jene Nissen and Ron Filipowicz, "Passive acoustic monitoring for marine mammals during Navy explosives training events off the coast of Virginia Beach, VA", "*166th Meeting of the Acoustical Society of America*, San Francisco, CA, 2-6 December 2013. (Oral Presentation)

- Mandy Shoemaker, Anurag Kumar, **Carl Hager**, Cara Hotchkin, Dave MacDuffee, Jene Nissen and Ron Filipowicz, "Marine Mammal Monitoring during Navy Explosives Training Events off the Coast of Virginia Beach, Virginia", *20th Biennial Conference on the Biology of Marine Mammals*, Dunedin, New Zealand, 9-13 December 2013. (Accepted Poster)

- Son Nghiem, Paul B. Shepson, William Simpson, Donald K. Perovich, Matthew Sturm, Thomas Douglas, Ignatius G. Rigor, Pablo Clemente-Colón, John P. Burrows, Andreas Richter, Alexandra Steffen, Ralf Staebler, Daniel Obrist, Christopher Moore, Jan Bottenheim, Ulrich Platt, Denis Pöhler, Stephan General, Johannes Zielcke, Jose D. Fuentes, Dorothy K. Hall, Lars Kaleschke, John Woods, **Carl Hager**, Joe Smith, Charles R. Sweet, Kerri Pratt, Kyle Custard, Peter Peterson, Steve Walsh, Erin Gleason, Eyal Saiet, Melinda Webster, Ross Lieb-Lappen, Christopher Linder, Gregory Neumann, "Science Progress from the Bromine, Ozone, and Mercury Experiment (BROMEX)", *Davos Atmosphere and Cryopshere Assembly*, Davos, Switzerland, 8-12 July 2013. (Oral Presentation)

- S. V. Nghiem, P. B. Shepson, W. Simpson, D. K. Perovich, M. Sturm, T. Douglas, I. G. Rigor, P. Clemente-Colón, J. P. Burrows, A. Richter, A. Steffen, R. Staebler, D. Obrist, C. Moore, J. Bottenheim, U. Platt, D. Pöhler, S. General, J. Zielcke, J. D. Fuentes, D. K. Hall, L. Kaleschke, J. Woods, **C. Hager**, J. Smith, C. R. Sweet, K. Pratt, K. Custard, P. Peterson, S. Walsh, E. Gleason, E. Saiet, M. Webster, R. Lieb-Lappen, C. Linder, and G. Neumann, "Arctic Sea Ice Reduction and Tropospheric Chemical Processes", *Proceedings of the Fourth International Conference on Bioenvironment, Biodiversity and Renewable Energies - BIONATURE 2013*, Lisbon, Portugal, 24-29 March, 2013. (Accepted Paper)

- **Hager, C.A.,** Woods, J., Zakoian, N., Schmitt, J., Wales, S., Means, S., Schieve, B., Parker, W., "Quantifying near real time, under-ice, 1/3 octave ambient noise levels in the Chukchi Sea using an autonomous, satellite-linked and portable sensor design", *9th Annual Polar Technology Conference*, Annapolis, MD, 2-4 April 2013. (Invited Speaker)

- **Hager, C.A.**, "Leadership: Theory Evolution and Personalization", *National Ocean and Atmospheric Administration (NOAA) Commanding Officer and Chief Marine Engineer Conference*, Virginia Beach, VA, 7-9 January, 2013. (Invited Speaker)

- **Hager, C.A.,** Sturzbecher, J., Kumar, A., "Acoustic detection of Atlantic bottlenose dolphin (*Tursiops truncatus*) vocalizations using SSQ-53F sonobuoys modified for autonomous data collection", *19th Biennial Conference of the Society for Marine Mammalogy*, Tampa, FL, 27 November – 2 December, 2011. (Poster).

- **Hager, C.A.,** Shoemaker, M., Kumar, A., "Marine Mammal Monitoring during a Navy Explosives Training Event off the Coast of Virginia Beach, Virginia", *5th International Workshop on Detection,*

Classification, Localization, and Density Estimation of Marine Mammals using Passive Acoustics, Portland, OR, 22-25 August 2011. (Oral Presentation)

- **Hager, C.A.,** Sturzbecher, J., Kumar, A., "Acoustic detection of Atlantic bottlenose dolphin (*Tursiops truncatus*) vocalizations using SSQ-53F sonobuoys modified for autonomous data collection", *5th International Workshop on Detection, Classification, Localization, and Density Estimation of Marine Mammals using Passive Acoustics*, Portland, OR, 22-25 August 2011. (Accepted Poster)

- **Hager, C.A.**,"Assessment of the Performance of the Near-Bottom Hydrophones of the U.S. Navy Southern California Offshore Range in Detecting, Localizing and Reconstructing 10-20 kHz Odontocete Whistles", Dissertation (Ph.D. in Physical Oceanography), Naval Postgraduate School, Monterey, CA, 2008.

- Chiu, C.-S., Collins, C.A., **Hager, C.A**., Miller, C.W., Moore, T.C., Rocheleau, M.R., Lashkari, C., and Hayes, S., "A Feasibility Study of Monitoring Blue Whales Using the Pt Sur Ocean Acoustic Observatory," *134th Meeting of the Acoustical Society of America*, San Diego, CA, 1-5 December 1997. (Oral Presentation)

- **Hager, C.A**., "Modeling the Performance of the Pt. Sur Hydrophone Array in Localizing Blue Whales," Thesis (M.S. in Physical Oceanography), Naval Postgraduate School, Monterey, CA, 1997.

AWARDS AND ACCOMPLISHMENTS

- Department of Atmospheric and Ocean Sciences (ATOC) Service Award *(2020)*
- Selected as a member of the University of Colorado Learn More about Climate Teachers Advisory Board *(2015)*
- Presidential meritorious award for "Personalized, Student Centric Advising and Dedicated Professional Mentoring" *(2014)*
- Office of Naval Research Grant for Arctic Acoustic research *(2013)*
- Combined Federal Campaign "Eagle Award" for philanthropic innovation (*2010*)
- Finalist for Combined Federal Campaign "Spirit of the Community Award" for philanthropic leadership (*2010)*
- Presidential meritorious award for "Superb leadership and exceptional technical expertise" *(2003)*
- Selected as a "United States Naval Academy Permanent Military Professor" *(2002)*
- Awarded full scholarship for doctoral studies (*2002)*
- Commendation for "Meticulous planning and superb management of limited assets" *(2000)*
- Commendation for "Exceptional professional ability and initiative" *(2001)*
- Commendation for "Leadership, exemplary performance and superb management" *(1994)*
- Selected as Association of Naval Aviation's (ANA) "Naval Flight Officer of the Year" *(1994)*
- Recognized for "Uncommon dedication and tireless energy" *(1993)*
- Selected for the "William E. Mize Leadership Award" for inspirational peer leadership *(1990)*

TEACHING EXPERIENCE / CURRICULUM DEVELOPMENT

Pedagogical topics include: Atmospheric and ocean fluid dynamics, physical oceanography, meteorology, geology, marine mammal conservation, behavioral ecology of pelagic and coastal cetaceans, marine bio-acoustics, nutrient distribution and cycling, marine primary productivity, trophic structure and ecosystem dynamics, biodiversity, marine ecology, estuarine processes, and climatology.

Instructor / Assistant Professor Adjunct, Department of Atmospheric and Oceanic Sciences (ATOC) & Global Studies and Baker Residential Academic Programs, University of Colorado, Boulder CO 80309 (2019 to Present)

- Weather and the Atmosphere – ATOC 1050: Introduces principles of modern meteorology for non-science majors, with an emphasis on scientific and human issues associated with severe weather events. Includes description, methods of prediction, and impacts of blizzards, hurricanes, thunderstorms, tornadoes, lightning, floods, and firestorms. Summer 2019 / Fall 2019 (2 sections) / Spring 2020 / Summer 2020.

- Our Changing Environment: El Nino, Ozone and Climate – ATOC 1060: Discusses the Earth's climate for non-science majors, focusing on the role of the atmosphere, oceans, cryosphere and land surface. Describes the water cycle, atmospheric circulations and ocean currents, and how they influence global climate, El Nino and the ozone hole. Discusses human impacts from climate change. Fall 2019 - Spring 2022.

- Tropical Island and Marine Ecology – EBIO 2090: Examines fundamental concepts of marine ecology, emphasizing organismal diversity, species interactions, dispersal, colonization, physiology and adaptations. Includes study of beach and coral formation, island organisms and their population dynamics. Fall 2019 - Spring 2022.

- Introduction to Oceanography – ATOC / GEOL 3070: Explores Earth's dynamic oceans. Discusses the disciplines of oceanography including marine geology, chemistry, biology and physical oceanography with emphasis on global change. Specific topics may include: tectonics, currents, biogeochemical cycles, ecology and global warming. Fall 2019 - Spring 2022.

- Descriptive Physical Oceanography - ATOC 4215: Introduces descriptive and dynamical physical oceanography, focusing on the nature and dynamics of ocean currents and their role in the distribution of heat and other aspects of ocean physics related to the Earth's climate. Dynamical material limited to mathematical descriptions of oceanic physical systems. Spring 2022.

Assistant Professor (Non-Tenure Track), Oceanography Department, United States Naval Academy, Annapolis MD 21402 (2000-2001 and 2006-2014)

- Earth System Science I – The Fluid Earth SO271 **(Course Developer)**: Topics include: atmospheric thermodynamics, structure of earth's atmosphere, clouds and precipitation, basic atmospheric circulation, winds, weather, climate patterns, ocean structure, ocean circulation, underwater acoustics, waves and tides, and air-ocean interactions.

- General Oceanography I - SO231: An introductory course that provides a descriptive analysis of geological, chemical and physical oceanography. Course content includes sea floor spreading, properties and composition of seawater, ocean currents, fluid dynamics, underwater acoustics, large-scale ocean circulation, tidal theory, waves and water masses.

- General Oceanography II - SO234: This course serves as a follow on to SO231and focuses on the interactions of oceanic physical processes with geological, biological, and chemical processes. Topics include: chemical properties of seawater, marine biogeochemistry, nutrient distribution and cycling, marine primary productivity, trophic structure and ecosystem dynamics, biodiversity, marine ecology, and estuarine processes and ecology.

- Introduction to Oceanography - SO221: A descriptive course designed to provide an overview of significant oceanographic factors and their impact on engineering applications. This course is designed for non-Oceanography majors.

- Marine Mammal Conservation and Bioacoustics - SO486A **(Course Developer)**: An introduction to marine mammal conservation as it directly applies to naval operations. Topics include: whaling history, 20th century conservation efforts, behavioral ecology, species specific acoustic repertoires, anthropogenic noise, and analysis of Navy mid-frequency sonar impact events. Laboratory exercises focus on time series analysis and MATLAB based signal processing techniques including energy detection, spectrogram correlation and matched filtering.

- Capstone Seminar in Oceanography / Bioacoustics **(Course Developer)**: A seminar course designed to provide guidance on the construction of a senior year capstone paper. Topics include: scientific journal article interpretation, scientific writing and public speaking.

Adjunct Professor, Anne Arundel Community College, Arnold, MD 21012 (2009)

- General Oceanography - PHS 109: A multidisciplinary survey of physical, chemical, meteorological, biological and geological aspects of oceans. Topics include waves, currents, tides, chemistry of seawater, ecosystems and life in oceans and estuaries, plate tectonics, underwater acoustics, marine sediments and discussions of environmental trends and problems.

UNDERGRADUATE ADMINISTRATION EXPERIENCE (UNITED STATES NAVAL ACADEMY)

- Senior Academic Advisor - Oceanography Department (2006-2013). Led and managed all student advising, scheduling, major change processing and new student recruitment for 20 faculty / 200+ student department. Trained new faculty and tutored colleagues.
- Academic Advisor - Oceanography Department (2006-2013). Mentored and counseled over 150 undergraduate students during tenure.
- Faculty Senator (2011-2013)
- Faculty Senate Executive Steering Committee (2012)
- Faculty Senate Core Curriculum Committee (2011-2013)
- Academic Center Representative – Math and Science Division (2007-2013). Mentored and provided support for students struggling with academics.
- Clements and APGAR (Faculty Teaching) Award Committee – All Divisions (2007-2013)
- Hendrix and Williams (Department's Top Students) Award Committee Chair (2007-2013)
- Faculty Representative for the Navy Women's Soccer Team (2009-2013)
- Internship Coordinator – Oceanography Department (2006-2013). Scheduled and coordinated over 350 undergraduate STEM internships. Acted as primary liaison with the National Science Foundation for annual Naval Academy and Air Force Academy student exposure trips to Antarctica.
- French Naval Academy Exchange Program Sponsor – Oceanography Department (2013). Mentored Ensigns Nicolas Schmitt and Jonathan Zakoian in original Arctic acoustic research.

EDUCATIONAL OUTREACH

- "Maury Project" Underwater Acoustics Lecturer (2006-2013): The Oceanography Department of the U.S. Naval Academy in partnership with the *American Meteorological Society (AMS)* and funding by the Navy (*Commander, Naval Meteorology and Oceanography Command [CNMOC]* and the *Office of Naval Research [ONR]*, the *National Oceanic and Atmospheric Administration [NOAA]* and the *State University of New York at Brockport*, conducts a national teacher enhancement project to train 22-25 precollege teachers annually in selected physical oceanography topics. The Maury Project has been responsible for training a national network of approximately 350 teachers at the K-12 level on the fundamentals of physical oceanography at two-week workshops held each summer.

- "Whale Ecology, Conservation and Acoustics" Gifted and Talented Lecturer (2012-2013): A program that provides science topic enrichment for students in Anne Arundel County Public Schools. This four-part (2.5 hours each) class is dedicated to understanding the behavioral ecology, conservation challenges and acoustic behavior of whales.

- "United States Naval Academy Summer Seminar" Lecturer (2006-2013): This seminar exposes potential candidates who have completed their junior year in high school to the academic, athletic and professional

training challenges that they would encounter if they received an appointment to the institution. Over 700 students receive a 75 minute lecture and underway laboratory session annually.

- "United States Naval Academy Summer STEM Program" Lecturer (2006-2013): This program is designed to encourage rising 8th grade to 11th grad to pursue a course of study in Science, Technology, Engineering and Mathematics throughout high school and college. Approximately 60 students (annual) receive a lecture on "Whale Ecology, Conservation and Acoustics".

UNDERGRADUATE STUDENT RESEARCH / MENTORSHIP

- Honors / Independent Research Adviser for:

  - Thompson, Jeb, "Characterization of Delphinid vocal response to underwater detonations at the VACAPES Operating Area" (2012)

  - Minker, Raychel, "Quantifying assumed vocal mimicry encountered during a playback experiment with Spectrogram Correlation" (2011)

  - Westlund, Josh, "Statistical analysis of assumed Delphinid vocal mimicry encountered during a playback experiment" (2011)

  - O'Dell, Isaac and Sturzbecher, Jennifer, "Modification of a SSQ-53F Difar sonobuoy for autonomous data collection" (2010)

  - Smith, Karen, "Propagation loss modeling for Navy explosive underwater detonation (UNDET) events in the Virginia Capes (VACAPES) R6606 / W50 Operating Area" (2010)

  - Maloney, Johanna, "Performance variability with hydrophone detections of synthetic Odontocete vocalizations during a playback experiment at the U.S. Navy SCORE Underwater Range" (2010)

  - Lagrew, John, "Vertical localization of Synthetic Odontocete Vocalizations" (2009)

  - Meidus, Alfonso, "Horizontal localization of synthetic Odontocete Vocalizations" (2009)

  - Griffin, Kate, "Matched filter detection of beaked whale vocalizations using data collected on a High Frequency Acoustic Recording Package (HARP) off Pt Sur, CA" (2008)

  - Mahler, M. Paige, "Energy detection of Odontocete vocalizations using raw sonobuoy recordings at the U.S. Navy SCORE Underwater Acoustic Range" (2007)

- Collaborative Research Adviser for:

  - Parker, William, Schieve, Bradford, Schmitt, Nicolas, Zakoian, Jonathan, "Calibration and field results of an autonomous under ice hydrophone used to collect near real-time, 1/c octave band noise levels", Co-Advisers: John Woods, *Oceanography Department, United States Naval Academy*, Stephen Means and Stephen Wales, *Naval Research Laboratory, Washington D.C.* (2013)

  - Ensigns Nicolas Schmitt and Jonathan Zakoian (*French Naval Academy*), "ICEGOAT 2A: Programming an autonomous device to monitor Arctic ambient noise", Co-Advisers: Stephen Means and Stephen Wales, *Naval Research Laboratory, Washington D.C*. (2013)

  - Jenkins, William F, "Active disruption of underwater communications using snapping shrimp noise" Co-Advisers: Ed Tucholski, *Physics Department, United States Naval Academy* and Jeff Schindall, *Naval Research Laboratory, Washington D.C*. (2009)

- Character / Honor Remediation Mentor for midshipman. This mentoring relationship, designed to enhance a midshipman's moral and ethical development, is one of a "reflective practicum" and consists of periodic discussions between teacher and student. One on one counseling is followed by periods of individual work and reflection. (2008-2013)