

**Department of Marine Sciences
Annual Report Narrative 2014 – 2015**

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FACULTY NEWS AND HIGHLIGHTS

The Department of Marine Sciences (DMS) is a multi-disciplinary department conducting interdisciplinary research in biological, chemical, geological and physical oceanography, marine biology and marine meteorology. In recent years, the Department has greatly increased its research expertise and scholarly activities in Climate-related sciences through its Climate and Human Alteration of Coastal Ecosystems (CHACE) initiative that resulted in 3 faculty hires. The DMS is a leader in ocean observing initiatives with its own Long Island Sound Integrated Coastal Observing System (LISICOS) and Coastal Laboratory for Marine and Atmospheric Sciences (CLAMS, currently under construction) and significant involvement with the NSF funded Ocean Observing Initiative (OOI). While the DMS remains a national leader in Coastal Oceanography, its faculty has conducted research in all 7 seas during the past 3 years including field campaigns in the Arctic, Antarctic and Indian Oceans. We highlight a few of our scholarly success stories in the following sections, starting with achievements by our youngest faculty members.

Asst. Prof. Hannes Baumann formally joined the department at the start of the academic year. Hannes was the last of our CHACE hires. He is an evolutionary fish ecologist who studies how coastal marine fishes can adapt to natural and man-made changes in their environment. This includes changes in pH (ocean acidification) and temperature (global warming) and an example of his research is described in <http://today.uconn.edu/2015/03/evolving-to-cope-with-climate-change/>. Hannes is off to a terrific start and was recently awarded an NSF grant to study the impact of ocean acidification and hypoxia on the Atlantic silverside (details below).

Asst. Prof. Kelly Lombardo is a coastal meteorologist and climate modeler who is building our curriculum in marine meteorology. She has gained national recognition for her work on intense convective systems and extreme weather, and was invited to join the Program Committee for the American Meteorological Society's Conference on Severe Local Storms. Her expertise was rewarded with an NSF grant to model the behavior of potentially harmful squall lines as they propagate across Long Island Sound (detail below).

Asst. Prof. Melanie Fewings is a coastal physical oceanography who is an expert in the use of remotely sensed data from Satellites. She is the Leader of NASA's Coastal Scatterometry Working Group and is working on data collected during NASA's RapidScat mission, which is providing remotely sensed wind measurements from the Space Station! Melanie is also a Mentor Group Leader for the Mentoring Physical Oceanography Women to Increase Retention (MPOWIR), which is a community-based program that provides mentoring to physical oceanographers from late graduate school through their early careers.

Assoc. Prof. Penny Vlahos was awarded a Fulbright Specialists grant for Chemistry Education as part of her sabbatical stay at the University of Peradeniya, Sri Lanka. Penny has set up a blog to share her experiences in Sri Lanka at <http://srilankafulbright.blogspot.com/>.

Assoc. Prof. in Res. Jamie Vaudrey is the President of the New England Estuarine Research Society (NEERS). NEERS is a non-profit organization with a wide ranging membership from scientific and educational institutions, federal, state, and municipal agencies, and nonprofit organizations. Jamie, with help from DMS faculty, staff, and students, organized the Fall NEERS Meeting held at Avery Point this past October. By all accounts, the meeting was very successful and gave ample opportunities for undergraduate and graduate researchers to present their work.

Assoc. Professor Mike Whitney and Professor Evan Ward have started a new CT Sea Grant project on “Modeling *Vibrio parahaemolyticus* Outbreaks in Commercial Shellfish Areas” with co-PI Krisin DeRosia-Banick (CT Bureau of Aquaculture). *Vibrio parahaemolyticus* (Vp), a naturally occurring marine bacterium, is a growing threat to producing safe seafood from Connecticut and can be pathogenic for humans. Higher summer water and air temperatures can exacerbate Vp problems. The main question this research project is: How do the spatial and temporal patterns in water temperature and salinity over Norwalk commercial shellfish areas influence Vp concentrations in oysters? The Norwalk area was selected because of its commercial importance and past occurrence of Vp outbreaks. Early project results already have been applied to the 2015 shellfish management plan.

Prof. Tim Byrne was promoted to full Professor this year. As further recognition of his many accomplishments, he was invited by the Tectonics Program Director at NSF to submit a proposal for a workshop on “Feedbacks and Coupling Among Climate, Erosion and Tectonics” (FACET). He organized a committee of well-respected climate scientists, geologists and geomorphologists and we submitted a proposal in December. The proposal was reviewed and funded in February (~\$89k). The NSF grant allowed UConn to sponsor 45 American scientists, including 11 students, at a 6-day workshop that included two field trips to the Central Range of Taiwan. The workshop was opened by the Minister of Science and Technology in Taiwan and attended by 5 NSF representatives as well as over a 100 Taiwan geoscientists. The workshop, and its success, was clearly important to both the Ministry of Science and Technology in Taiwan and the NSF.

Prof. Robert Mason was elected to the Connecticut Academy of Science and Engineering (CASE), bringing the number of current Marine Sciences faculty so honored to 13. Rob is recognized internationally for his research on the environmental biogeochemistry of trace metals, especially mercury, with emphasis on oceanic ecosystems, the atmosphere, and air-sea exchange processes.

Prof. Pieter Visscher received visiting professorships at the University of Bourgogne and the prestigious Institut de Physique du Globe Paris. During his visit to the Institut, he gained access to the CNRS synchrotron Soleil in a novel approach to provide evidence of microbial involvement in sedimentary processes.

Prof. Hans Dam was invited to give the plenary talk entitled “Phenotypic Plasticity and Evolutionary Thermal Adaptation in the Copepod Genus *Acartia*” at the 12th International Conference on Copepoda, July 2014. Seoul, Korea.

Prof. Emeritus Bill Fitzgerald was selected to become a Fellow of the American Geophysical Union. Bill’s selection was in recognition of his eminent contributions to research on global biogeochemical cycles of trace metals, and the environmental impact resulting from metal emissions associated with human endeavors. Bill was celebrated during the Honors Ceremony and banquet at the 2014 AGU Fall Meeting in San Francisco.

GRADUATE EDUCATION AND ACCOMPLISHMENTS

The DMS is proud of its graduate program in Oceanography and has a long history of educating excellent young scientist who go on to make their own contributions in oceanography and marine sciences. An excellent recent example is Dr. Michael Finiguerra, who was a graduate student of Prof. Hans Dam and is now a standout APIR for the EEB Department at Avery Point. During AY2014-2015, a total of 37 students were enrolled in Marine Sciences' graduate program in Oceanography, including 27 PhD and 10 MSc. During AY2014-2015, 3 Ph.D. and 2 Master's degrees were conferred; mean times-to-degree were 4.6 years and 3.5 respectively. Obviously, our success at graduating our students requires a strong recruitment effort and our yields continue to increase. Specifically, we received 45 applications for Fall 2015 entry; we made offers of acceptance to 12 applicants, of whom 9 (4 Ph.D. and 5 M.S.) accepted. We are currently awaiting response from 1 applicant and will potentially accept 1 additional applicant. The additional of 9-11 students will more than offset the number of graduate students, bringing our total up to 41-43 graduate students to start AY2015-2016. Marine Sciences has also been able to maintain our policy of full Graduate Assistantship support for all students through TAs from CLAS, AP, and DMS; RAs from extramural grants and contracts (the primary source of funding); and/or fellowships from private gifts, endowments, and the University.

A few of the notable accomplishments from our students include:

- PhD student Zair Burris won the NEERS Dean Award for Best Graduate Student Poster with her presentation *Spermatophore Production as a Function of Food Availability in the Marine Copepod *Acartia Hudsonia** at the meeting of NEERS held at UConn, Oct. 16-17.
- PhD student Gihong Park won the Best Student Poster Award at the with his poster *Spatial-temporal Variability of the Copepod Community in Long Island Sound* at the 12th International Conference on Copepoda held in Seoul, Korea.
- PhD student Maria Rosa was awarded a KVA grant for Internationalization and Scientific Renewal at the Sven Lovén Centre for Marine Sciences at the University of Gothenburg, Sweden. She will be participating in a research project examining and characterizing mineralizing hemocytes in two oyster species using flow cytometry.

UNDERGRADUATE EDUCATION

The Marine Sciences' undergraduate program has continued to grow under the leadership of Program Coordinator Claudia Koerting. Applications to our program remained high for the fourth straight year with 12 students accepting at Avery Point and another 10 students accepting at Storrs. The total number of students increased from 52 students in the fall of 2011 when the name of the major was changes from Coastal Studies to Marine Sciences to 74 students in the fall of 2014. While we don't have exact numbers, this fall's entering freshmen class appears even larger. While the name change clearly helped in our recruitment efforts, the sustained growth is due to recruitment efforts both locally and at Storrs. We are particularly pleased with the growth of student enrollment at Storrs and are working to improve retention of these students by making it easier to stay at Storrs for the first two years. For example, we have worked with Geosciences to set up MARN 2002 labs in Beach Hall, which allows students to take this sophomore level course at Storrs using iTV and this lab. Other retention tools include providing our undergraduates with a growing number of research projects provided by DMS faculty during the academic year and in the summer.

RESEARCH and SCHOLARSHIP

Research and scholarship are paramount for Marine Sciences; our publication rates are excellent by the usual metrics of our disciplines as evidenced by individual rankings in Google Scholar and Research Gate. For 2014-2015, the 20 tenure-track faculty reported publication of

a total of 59 peer-reviewed publications, including both papers and book chapters. A number of these publications demonstrate both the visibility and recognition of our faculty members and the many successful research collaborations among department faculty, staff, and students. Notable examples, three of which highlight our research in the climate sciences, are:

- **Prof. Hans Dam** and his lab published two significant contributions in ALSO's top rated journal *Limnology and Oceanography* entitled "Influence of predator-prey evolutionary history, chemical alarm-cues and feeding selection on induction of toxin production in a marine dinoflagellate" and "First evidence of biased sex ratios at birth in a calanoid copepod."
- **Prof. Pieter Visscher** and his colleagues published evidence of Arsenic-based life from 2.72 billion years ago in the prestigious journal *Nature Geosciences*. The group assessed the chemistry and nature of cell-like globules found in 2.72-billion-year-old fossil stromatolites from Western Australia. The globules were composed of organic carbon and arsenic and their investigation suggests that life existed as a result of arsenic cycling before the Earth's atmosphere and ocean were oxygenated.
- **Prof. James Edson and Asst. Prof. Kelly Lombardo** each published papers in the *Journal of Climate* entitled "The MJO and Air–Sea Interaction in TOGA COARE and DYNAMO" and "Evaluation of Historical and Future Precipitation over the Eastern U.S. and Western Atlantic Storm Track using CMIP5 Models," respectively. James' paper described observation of a naturally occurring climate phenomenon known as the Madden-Julian Oscillation, while Kelly's paper used a climate model to predict precipitation patterns in the Northeastern US.
- **Prof. David Lund** published a paper entitled "Atlantic Overturning Circulation Decline as Trigger for Early Deglacial CO₂ Rise" in the journal *Climate of the Past*. This paper combines paleoclimatology with physical oceanography to explain observations in past climate record.

Another measure of Marine Sciences research accomplishments is the number, diversity, and funding level of extramural grants and contracts. This year, the 20 tenure-track faculty members were engaged in a total of 67 active projects totaling \$24M, including funding from NSF, NOAA, DOD, NIH and EPA, as well as state, local, and private sources. Among this year's new awards are the following:

- **Asst. Professor Hannes Baumann** received an NSF award (\$711K over 3 years) entitled *Understanding the Effects of Acidification and Hypoxia within and across Generations in a Coastal Marine Fish*. The project will investigate the combined effect of these two stressors on the common *Atlantic silverside* in our Ranklin Lab facility with funding for two graduate students.
- **Asst. Professor Kelly Lombardo** received an NSF award (\$292K over 3 years) entitled *Toward a Further Understanding and Improved Forecasting of Coastal Quasi-linear Convective Systems*. The project will investigate the behavior of potentially dangerous squall lines as they move across coastal regions like Long Island Sound. This study will support a graduate student and will provide hands-on experience with numerical modelling.
- **Asst. Professor Julie Granger** received an NSF award (\$367K over 3 years) entitled *GEOTRACES Arctic Ocean Section, Constraining Nitrogen Fluxes and Transformations Using Natural Stable Isotope and Dissolve Gas Tracers*. Her research will investigate the biogeochemistry of the Nitrogen-cycle in the Arctic Ocean and its impact on the Arctic's ecology, productivity and carbon cycle with support for a graduate student.
- **Prof. David Lund** received an NSF award (\$324K over 3 years) entitled *Diagnosing the Origin of Isotopically Light Carbon in the South Atlantic during the Last Deglaciation: An Oceanic or Geologic Source?* As the title implies, the research will attempt to identify

the course of light carbon to help unravel the mechanisms that drive atmospheric CO₂ variability on glacial-interglacial timescales and will support both undergraduate and graduate researchers.

- **Prof. George McManus, Prof. Evan Ward and Assoc. Prof. Penny Vlahos**, in collaboration with Profs. John Settlage and Suzanne Wilson in the Neag School of Education, received an NSF award (\$1.2M over 5 years) entitled *Husky Teach: Next Generation STEM Teachers*. The funding will be used to recruit, prepare and support a diverse and talented group of professionals to become science teachers in high-needs settings.
- **Prof. Robert Mason** received an NIEHS award (\$473K over 5 years) entitled Sources and Protracted Effects of Early Life Exposure to Arsenic and Mercury. The research will be conducted in collaboration with Dartmouth College Toxic Metals SRP Center. Rob's will investigate methylmercury accumulation in fish and how environmental factors affect mercury in estuarine food webs, which are important pathways of exposure to humans.

SERVICE AND OUTREACH

The DMS is actively involved in Service and Outreach activities at the Avery Point campus, Southeastern Connecticut and beyond. A few of these activities include:

- Our graduate students held the Taste, Touch, and Smell of Science day camp this past September. Organized by PhD student Maria Rosa and graduate student volunteers, the TTSS is a one day summer camp that provides numerous hands-on activities to students and their parents in the marine sciences.
- DMS faculty and staff participated with NURTEC and Maritime Studies in the Marine Career Night for High School Students held at the Mystic Aquarium in December. This open house is a special evening for high school students and their families to learn about the wide variety of careers available in the field of marine sciences.
- Our dive officer Jeff Godfrey participates in the Boston Sea Rovers Show in March. This show is a marine career opportunities fair for High School and college students to come in and learn about marine based career opportunities.
- DMS faculty were active participants as Science Judges and Mentors in the Quahog Bowl held on the Avery Point campus this past February. This competition brings together teams of high school students from throughout Connecticut and Rhode Island for a day of academic competition based on ocean-themed content.
- PhD student Amanda Vieillard was featured in an episode of Aqua Kids <http://youtu.be/-bB2RU-IUqU>. The show was taped at an oyster farm at Fisher's Island, New York. Amanda demonstrated how oysters are capable of providing an ecosystem service by cleaning up excess nitrogen in the water.

GIFTS TO MARINE SCIENCES

Two long-term private gift funds have been extremely important for the life of the Department and the success of our graduate students. The Feng Memorial Scholarship Fund and the Feng Marine Sciences Student Activity Fund are named for the founding Head of the Department, Prof. Sung Yen Feng. These funds are used in part to fund proposals from students to participate in summer courses and for professional travel.

The William A. Lund, Jr. Fellowship Fund, established in 2010 to honor the memory of a Marine Sciences faculty member, provides valuable support to encourage students to publish the results of their research and thus help ensure that our graduate students have publications prior to graduation.