UCONN | COLLEGE OF LIBERAL ARTS AND SCIENCES

Department of Marine Sciences

Fall 2020 Newsletter

GREETINGS FROM THE DEPARTMENT HEAD

The past summer and fall have certainly been like no others. Nonetheless, the Department continues to meet the challenges brought about by the COVID-19 pandemic. With the opening of laboratories in late spring, faculty, staff and students were able to reestablish research and work over the summer and into the fall, albeit at a slower pace as a result of procedures to keep everyone safe. This fall we continue delivering online and hybrid courses, holding virtual meetings, and advising and mentoring students remotely. In June, the Department saw its first online defense (Dr. Matt Sasaki) and since then we have had several more. I thank everyone in the Department for their dedication and professionalism as we navigate these difficult times and keep the Department moving forward.

Despite these difficulties, faculty, staff and students have been very active over the past six months, and some of these activities are highlighted in this fall 2020 newsletter. Within its pages you will find an alumni interview with Amina Schartup ‘12 Ph.D.; a spotlight article about our newest assistant professor, Leonel Romero; a popular-science piece about building the groundwork for remote sensing of plastics in the ocean; and more.

I wish everyone a healthy, happy, and productive new year.

J. Evan Ward

PROFESSOR AND HEAD, DEPARTMENT OF MARINE SCIENCES

WHERE ARE THEY NOW?

Alumni Spotlight – Amina T. Schartup

Dr. Amina Schartup is a Marine Sciences alumna who recently started as an assistant professor at Scripps Institute of Oceanography, University of California, San Diego. She is currently working on setting up her lab at Scripps. Amina received her Ph.D. in Oceanography in 2012. At UConn, she studied mercury cycling in sediments with Dr. Robert Mason. This interview was carried out by Patricia Myer, a current graduate student, on October 23rd, 2020. We discussed her current situation, unique career path, and advice for grad students.

Q: WOULD YOU MIND TELLING ME ABOUT SETTING UP A LAB DURING THESE TIMES?

A: I think that setting up a lab in normal circumstances is quite challenging, because you have so many moving pieces. It's really difficult to know where to start. You have to build the lab, the physical space, but then you also have to build the group – build that cohesion between you and whoever comes into your group, and start a culture. People don't think about it sometimes, but that's when you decide what the culture of your group is going to be.

You also have to equip your lab. You need to buy the instruments, deal with salespeople, choose what you want down to the smallest beaker. It's just a lot of details, and now we're doing a lot of this remotely, without the option to meet in person. Bringing in students and creating that culture in your group when you cannot be in the same room is not ideal.

Q: WHAT PATH DID YOU TAKE TO GET TO YOUR CURRENT POSITION FROM UCONN?

A: After I graduated in 2012, I started as a postdoc at the Harvard School of Public Health, working with Elsie Sunderland. I was there for two and a half years, and then she actually moved to a different position at the Harvard School of Engineering and Applied Sciences. I moved with her as a Research Associate until 2017. In 2017 I started an AAAS Science and Technology policy fellowship. I was placed at the Office of Polar Programs at the National Science Foundation, and I was there until 2019. After that I came to Scripps.

When I started the AAAS position, I was trying to figure out what I wanted to do career-wise. I wasn't decided on whether I wanted to remain in academia or not. There were three reasons why I wanted to do this fellowship. One, I thought that if I wanted to stay in academia, considering that a lot of students who get a Ph.D. do not necessarily end up in academia, I thought it would be difficult for me to advise them on career paths and choices if I had no experience with what a career looks like outside of academia. AAAS has such an amazing

track record at placing Ph.D.s in all kinds of private and government positions, they have a vast network of people that you can reach out to at any time. I thought it would be great to have these connections, so if my students decide they don't want to stay in academia, I have someone to reach out to, and I also know what these jobs look like.

Another reason is that I did not want to commit to a career path in academia for myself without knowing the other options out there, and whether this is the one thing that would work well for me in the long-term. This exposed me to those other jobs. I decided to go back to academia.

The other reason was that if I want to go into academia, I needed to know how proposals work and how to get funded. Being at NSF is a better place to learn how to write a good proposal, what gets funded, and how the review process works. A lot of people go into NSF as a rotator later on as academics. I thought it would be really nice to go in early on before I start the position, and that would increase my chances as I pursue my academic career. Those are the main reasons why I wanted to go into AAAS.

The difficulty was that if you want to go to academia, you have to maintain a productivity output of sorts. Which means I actually had two jobs. I had to do my AAAS job and I also had to do my academic job, so I was working three 11-hour days and one 7-hour day at NSF. Then the rest of the week would be science work, so, papers and research projects. I went out to the field on vacation time and did all kinds of crazy things to make sure I could still produce science while I was at NSF.

Q: WHAT DID YOU STUDY AT UCONN, AND HOW DOES IT COMPARE TO WHAT YOU DO NOW?

A: I did my Ph.D. in Oceanography with Rob Mason, and I studied mercury cycling in sediments mostly for my Ph.D. work, and then I had one side project where I was looking at what was happening in the water. I would say that the work I'm doing now is still quite similar, I still work on the same element for the most part. I think that where I grew was on the scale. I was mostly focused on smaller coastal areas, and as I moved through the different positions, I think the scale of my research changed to a more global and more of a systemic perspective, rather than just one aspect of the system such as sediment.

This is still in flux; this is partially what I'm trying to decide in my new position. What is it that I want my research to look like and what is it that I want my lab to do? It's actually quite exciting.

Q: HOW MUCH FREEDOM DO YOU HAVE IN CHOOSING EXACTLY WHAT YOUR LAB DOES? I KNOW A LOT OF PEOPLE WORKING ON THEIR PH.D.S AREN'T SURE IF THEY'RE LOCKED INTO SIMILAR PROJECTS FOR THE REST OF THEIR CAREER.

A: In theory, you have unlimited choices, I can go out there and decide I want to study leaves. Your limitations are your own capabilities and knowledge of course, but also what people are willing to let you get away with. As a scientist, you can be curious about anything, but at the end of the day you need to get your research funded and your papers published. Somehow these aspects are also related to what people's perceptions are of your capabilities.

I recently submitted a proposal about something that I thought was super interesting, and I really wanted to do, and I thought that I could actually do it – that even if I ran into difficulties that I could figure it out. And the proposal reviewers said "You have no experience in this thing, you can't do it." So that's where you get the pushback, you want to try something new, you want to try something different and branch out. You think you can do it, but people tell you that you can't, so they don't give you the money to actually try it out. I think that's the issue.

When you're trying to do something new, you have two options. You can work with somebody

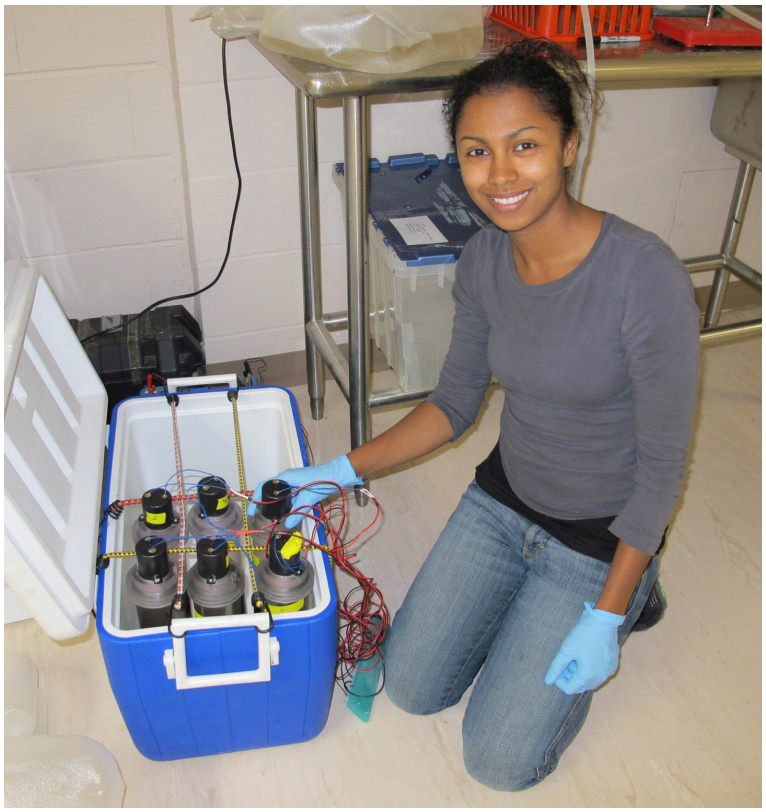
who is already well-established in the field and get in this way. Or, you can do the preliminary work and publish it, and show that you know something, and then you can rely on this to try something new.

Q: WHAT WOULD YOU SAY DURING YOUR GRAD SCHOOL EXPERIENCE BEST HELPED YOU PREPARE FOR YOUR CAREER?

A: It's really difficult to pinpoint exactly what made a difference. There are a few things. One thing was that I didn't have a set project that I came in to work on. I really had to come up with my own science, and I didn't necessarily have all the extra cash that comes in with a project to get analysis done and so on. I had to just run around the department and figure out how to use the instruments that were available, and think hard about how I can use my resources to do impactful science. Just having the freedom to think through it and work through it at my own pace, without the pressure of being on a specific project that needed deliverables, I think in the long run was helpful to me. I got lucky that what I tried out worked, it could have not worked and impacted my career in a negative way. So, in a way it was a combination of luck and the fact that I could just run around and do whatever I wanted, which was really nice.

Q: WHAT ADVICE WOULD YOU HAVE FOR CURRENT GRAD STUDENTS?

A: I think maintaining a life on the side is really important. I had two children during my Ph.D., my son was born in my first year and my daughter was 7 months at my defense. My husband always jokes that having children was really good for me because it forced me to have a life outside of the lab. That if it wasn't for them, I would be there 24/7, and I think that's true. I think that being forced to get out of that space and stopping the constant working and pushing yourself to extremes, and having a side life is good. It gives you the time to let ideas mature in your head, because I think our brains continue to work even if we're not necessarily focused on something. So, if you're stuck with an issue in the lab and can't see the big picture, I think having some time and space outside will let your brain do the work in the background.



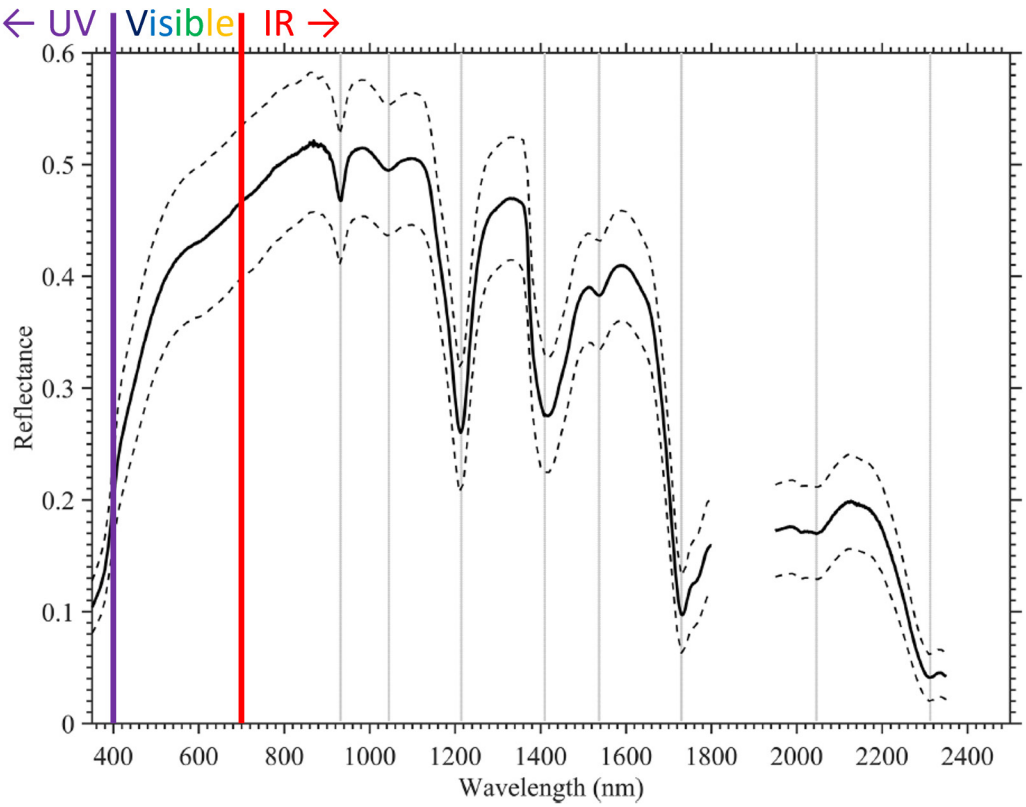
I think another thing that is really important is understanding that this is a personal journey; it is a collaborative journey, but it is a personal journey. You should make sure that you work with people and not compete with people, and really think about the fact that we all have our own paths to success, and it's really hard to tell what somebody's path will look like, you can only see it in hindsight. So, if you're competing on a day-to-day or week-to-week basis, it's not good, because you don't know where the person is going to go, and where you are going to go. If I was really focused on looking at what everybody was doing and how this reflects on me, and whether I fit in, having two children, I probably would have given up, because I wasn't as productive as I should have been or working as hard as I should have been. I just left that on the side and did what I needed to do. And it just worked!

Building the Groundwork for Remote Sensing and Tracking of Plastics in the Ocean

We've all heard stories about the garbage patches that are kilometers wide floating out in the ocean. While the "garbage islands" that many of us imagine are much closer to fiction, there is definitely a lot of plastic in the ocean, and most of it is in the form of microplastics less than 5 mm in size. This makes it difficult to identify and track the plastics that are floating around.

Satellites are able to find things like plankton blooms in the ocean by their *spectral information* (such as color). However, when it comes to plastics, they all have different colors and compositions and can be very small in size. This makes it tricky to distinguish plastic floating on the ocean surface.

In a recent publication, Professor Heidi Dierssen and a former postdoctoral researcher from her lab, Dr. Shungu Garaba now at the University of Oldenburg in Germany, built a database of the *spectral information* of many different types of plastics. They measured *spectral reflectance*, which represents the "color" of the objects, in the ultraviolet (UV), visible, and infrared (IR) parts of the spectrum. As explained in the publication, "The spectral reflectance of an optically active object (e.g. plastic, coral, seawater, algae, sediment) has a characteristic shape that explains how it can reflect or absorb light. The spectral shape is a combination of peak (reflection or fluorescence) features and trough (absorption) features that are distinctive optical properties of the objects."



The figure above is an example of a spectral reflectance measurement of marine microplastic particles, showing dips (troughs) of the curve highlighted with gray lines. These dips, called *absorption features*, are unique to the object and can help identify the type of plastic. Dashed lines represent standard deviation.

Dr. Dierssen and Dr. Garaba sampled many different types of plastics that are representative of what would actually be found floating in the ocean. "Many research studies on marine plastics

purchase new plastic bottles and other debris for their studies. This does not represent the actual objects found floating on the ocean surface and their environmental state," Dierssen explains. The types of plastics that were sampled included microplastics (0.3- 5 mm), macroplastics (>5mm), and new plastic polymer pellets (for comparison). Microplastics were collected from the Atlantic and Pacific Ocean using surface-sampling nets. Macroplastics were sampled at the Mystic Aquarium, as part of a traveling exhibit raising awareness about plastic pollution, titled "Washed Ashore: Art to Save the Sea." These plastics (buoys, containers, ropes, toys, nets, etc.) were collected from beach clean-ups on the West Coast. Dierssen describes that "their colors and material had been weathered by the sun and exposed to ocean turbulence. This provided a much closer library of real plastic objects that would be observed floating at sea than if we purchased new [plastics]."

The large plastics washed ashore are easily identifiable, but much less is known about the composition of the small microplastic particles found floating at the sea surface. To address this, Dierssen and Garaba also measured reflectance from new plastic pellets of 11 different polymer types. *Absorption features* of microplastics were compared to the plastic pellets to determine the closest matching spectral properties. The microplastics were most similar to low-density polyethylene and polypropylene often used in bottles and packaging material.

The measurements of the different types of plastics from this study are available in an open-access database as a reference for others. This data will help with remotely sensing and tracking plastics in the ocean, and eventually be used to identify the types of plastics floating around from satellites! As Garaba states, "Our contribution to the monitoring of plastics is the groundwork of understanding the key properties of plastics that can be used to develop algorithms/models/statistical approaches to derive essential descriptors about the plastics from remote sensing tools since these plastics have an optical signature or a unique light signal."

Dierssen and Garaba recently submitted a NASA proposal to continue their collaboration to develop ways to remotely sense microplastic particles across the global ocean. Look forward to hearing more from them in the future!

Citation:

Garaba, S. P., & Dierssen, H. M. (2020). Hyperspectral ultraviolet to shortwave infrared characteristics of marine-harvested, washed-ashore and virgin plastics. *Earth System Science Data*. DOI:10.5194/essd-12-77-2020

Dr. Leonel Romero Joins DMS as a New Faculty Member

This fall, the Department of Marine Sciences (DMS) enthusiastically welcomed Dr. Leonel Romero as a new assistant professor in physical oceanography. The DMS began the interview process for new physical oceanographers last spring. Romero's interview was in March, right before the university closed for the COVID-19 pandemic. This unique situation brought on a set of challenges in starting work at the department, including some delays and getting used to a new way of working, but Romero has been able to do much of his work remotely, and felt welcome despite the situation.

"A lot of the people in the department have been super helpful with my transition," Romero says. He looks forward to eventually being able to return to the department in person so that he can meet more of his colleagues. He was able to move into his office and lab space, but his biggest challenge is starting a lab group.

At UConn, Dr. Romero will be continuing his work on upper-ocean processes, ocean waves, and air-sea interaction. Previously, Romero was an Associate Researcher at the University of California Santa Barbara. In 2008 he received his Ph.D. in oceanography from the Scripps Institution of Oceanography. He received a bachelor's degree in physics from the University of California, San Diego, in 2002.

Romero's journey to becoming a physical oceanographer started early on in his life. He grew up in Mexico City and always loved math and physics. Before high school, he came across Hawking's Brief History of Time and was fascinated by it, which led him to pursue an education in astrophysics. Romero moved to San Diego for university, where he became fascinated with the ocean through surfing and his work. He became an undergraduate research assistant at Scripps Institution of Oceanography. "We were trying to understand the drifts of floats in the Southern Ocean," Romero says. "It's important to understand those currents because they regulate our climate, and I found it super rewarding to study ocean physics and the environment." When he took astrophysics classes, he found them too abstract, and he became passionate about oceanography.

While pursuing his Ph.D. in oceanography, Romero focused on air-sea interactions. "In order to improve our understanding of how weather and climate work, we actually need to understand ocean waves and I found that fascinating, and I pretty much dedicated

most of my career towards that.” Romero moved to Santa Barbara as a researcher to continue work on upper-ocean and interdisciplinary processes, such as utilizing runoff as a tracer for an ecological project. Romero decided to pursue a tenure-track position after teaching a class on waves, tides, and estuarine processes. He was drawn to UConn because of our department’s work focusing on air-sea interactions.

At UConn, Romero will work on an NSF-funded project to study interactions between waves and fronts, and their correlation with wave breaking. “If you have fronts, you happen to have more wave breaking, and so that has potential implications for how the CO2 gets into the ocean.” This project is “purely numerical with coupled ocean wave models,” which can all be done remotely. Romero also plans on starting an observational/modeling group at Avery Point in the future.

Outside of research, Romero has been enjoying the scenic Connecticut coastline. He loves to surf and go on walks in the area. As a seafood lover, he has been enjoying the abundance of good local seafood.

Research Continues Safely Amid COVID-19

COVID-19 has drastically changed all aspects of our lives, including how we teach, do research, and stay connected at UConn. The Department of Marine Sciences is adapting to a new normal, and this fall semester has been unlike any other.






Classes are mostly online, however, some courses have continued in person. In these situations, students are of course practicing social distancing and wearing their masks. Classes which feature research cruises and scuba diving were thankfully able to carry out these activities safely. Graduate student Wes Huffman comments on his positive experience with his online classes: “I initially thought an online discussion-based course would be challenging, with either no one discussing or people talking over each other. I have also previously found online lectures to be more challenging to pay attention to. However, video-based online discussion has worked exceptionally well and has been on par with similarly styled in-person courses.”

Research is affected but still continuing safely. Everyone working indoors is required to wear masks, social distance, and check in and out of each lab space for contact tracing. Most professors and students are working from home often or even entirely, only coming to campus when it is necessary. This has resulted in many adaptations to ongoing research. Wes shares, “One of my projects that has been ongoing during COVID is a series of mesocosm experiments… Remote monitoring and control of this experimental system have been critical in allowing me to continue working from home when possible while streamlining in-person sampling. This not only mitigates potential COVID exposure but has improved the quality of data gathered by being able to fine-tune parameters more frequently than otherwise feasible while in the lab.”

In such a unique situation, new opportunities have also been possible. Molly James, a graduate student, shares her experiences. “A great opportunity that I wouldn’t have been able to do under normal circumstances is attend meetings of the Governor’s Council on Climate Change (GC3). My advisor suggested I participate in the virtual meetings for the GC3’s Science and Technology Working Group. As a result, I produced information sheets for the public detailing climate change impacts and projections in Connecticut.”

This year, mostly everything has been online. Seminars and brown bags are both continuing regularly on WebEx. However, these weekly events were set times that many of us from the department would step away from our individual work and get to see each other. The online meetings, both professional and social, bring feelings of isolation, as expressed by many people.

On the bright side, since we’re all staying at home more than usual, this seems to have caused a widespread interest in pursuing new hobbies. Molly shares, “Some silly results of quarantining are rearranging my bedroom and living room (more than once) after becoming mildly addicted to DIY and home decor YouTube channels; baking many loaves of bread; attempting to become a jogger/runner; doing a language exchange with a friend in Seoul; and many hours on friend group video chats.”

Awards

Prof. James O'Donnell

O'Donnell was appointed to the Governor's Council on climate change, and now serves as the co-Chair of the Science Subcomittee. He co-authored two draft interim reports.

Prof. Pieter Visscher

Visscher was appointed to the executive committee of the Australian Centre for Astrobiology.

Prof. Cesar Rocha

Rocha received the Editors' Citation for Excellence in Refereeing for Geophysical Research Letters from the American Geophysical Union (AGU).

Kayla Mladinich (grad student, Prof. J. E. Ward)

The Ruth D. Turner Foundation awarded Kayla Mladinich the Ruth D. Turner Fellowship for her project titled "Evaluating bioindicator Species of Microplastics in the Marine Environment: A Comparison of Bivalves, Gastropods, and Tunicates."

Halle Berger (grad student, Prof. Catherine Matassa and Prof. Samantha Siedlecki)

Berger was placed with the NOAA OAR Ocean Acidification Program and NOAA NOS National Centers for Coastal Ocean Science Competitive Research Program as their coastal stressors (ocean acidification and harmful algae blooms) program coordinator as part of the 2021 Knauss Marine Policy Fellowship Program.

Grants

Prof. Heidi Dierssen

Dr. Dierssen was recently awarded a large NASA grant for an interdisciplinary project with colleagues at Rutgers University and University of Colorado exploring the uptake of carbon dioxide in a rapidly changing oceanic region near the West Antarctic Peninsula. Specifically, she will lead the team evaluating linkages between sea ice, mixed layer depth, optical properties, carbon export and other biogeochemical and physical parameters on phytoplankton biomass, community composition, and productivity.

Prof. Hans G. Dam

Linking eco-evolutionary dynamics of thermal adaptation and grazing in copepods from highly seasonal environments. National Science Foundation, $531,434. The grant tests how warming oceans changes the feeding habits of the most abundant animals on Earth, copepods.

Publications

Prof. Pieter Visscher

Dr. Visscher presents two new publications on arsenic cycling in the preoxygen world, based on research in 2.72 billion year old rocks and modern microbial mats in the Atacama Desert (Chile). This groundbreaking work has been featured in multiple online articles, radio, television, and newspapers. *(Visscher et al. (2020) Modern arsenotrophic microbial mats provide an analogue for life in the anoxic Archean. Communications Earth & Environment.) (Sforna et al. (2014) Evidence for arsenic metabolism and cycling by microorganisms 2.72 billion years ago. Nature Geoscience.)*

Prof. James O'Donnell

Dr. O'Donnell and colleagues worked on a collaborative project to model storm surge and wave heights for flood risk assessments. This project yielded an interactive map on the CIRCA website: The Connecticut Costal Towns Storm Annual Exceedance Probability/Return Interval Viewer. *(Liu et al. (2020) Estimating the Annual Exceedance Probability of Water Levels and Wave Heights from High Resolution Coupled Wave-Circulation Models in Long Island Sound. Journal of Marine Science and Engineering.)*

Prof. Rob Mason, Prof. Zofia Baumann, and Gunnar Hansen (grad student)

Sediment, water, forage fish and invertebrates were collected and analyzed for mercury forms from sites in the Still River, CT that had been impacted by mercury pollution from hat making in Danbury in the late 19th/early 20th century as well as from unimpacted sites to examine the legacy of this contamination. *(Anatone et al. (2020) Evaluating the impacts on local fish from the eastern United States. Chemosphere.)*

Prof. Heidi Dierssen

Dr. Dierssen published a new remote sensing method with colleagues from the NASA CORAL project in Remote Sensing of the Environment for classifying shallow seagrass and benthic algae habitats and simultaneously characterizing the water column properties including

phytoplankton concentrations. *(Garcia et al. (2020) Benthic classification and IOP retrievals in shallow water environments using MERIS imagery. Remote Sensing of Environment.)*

Prof. Hans G. Dam and Postdoc Matt Sasaki

Recent publication showing that genetic adaptation is important to predict how animals cope with the ongoing ocean warming. *(Sasaki and Dam (2020) Genetic differentiation underlies seasonal variation in thermal tolerance, body size, and phenotypic plasticity in a short-lived copepod. Ecology and Evolution.)*

Prof. Hannes Baumann

Recent publication showing that oxygen consumption in fish embryos, but not larvae, is affected by acidified water conditions. *(Schwemmer et al. (2020) Synergistic metabolic responses of embryos, but not larvae, of a coastal forage fish to acidification and hypoxia. Journal of Experimental Biology.)*

Recent publication showing that fish grow up smaller under acidified water conditions, but these effects do not differ between *males and females. (Murray et al. (2020) Are long-term growth responses to elevated pCO2 sex-specific in fish? PLOS One.)*

Prof. Cesar Rocha

Working on the problem of horizontal convection, Rocha and collaborators discovered a mathematical identity that relates the horizontal buoyancy flux (or heat flux) to the molecular dissipation of buoyancy (or temperature) variance. This new identify justifies the definition of a horizontal-convective Nusselt number in analogy to the Nusselt number of the more widely studied Rayleigh-Bénard convection. *(Rocha et al. (2020) The Nusselt numbers of horizontal convection. Journal of Fluid Mechanics.)*

Prof. Senjie Lin

Visiting scholars in Lin Lab Tangcheng Li and Hongfei Li recently published papers with Professor Senjie Lin in Science in the Total Environment about how a harmful algal bloom dinoflagellate and a coral endosymbiont dinoflagellate cope with nitrogen-nutrient deficiency and about tolerance of ammonium toxicity. *(Li et al. (2020) Transcriptome profiling reveals versatile dissolved organic nitrogen utilization, mixotrophy, and N conservation in the dinoflagellate Prorocentrum shikokuense under N deficiency. Science of The Total Environment.)*

Yipeng He (grad student, Prof. Robert Mason)

During a research cruise from Alaska to Tahiti, samples were collected for determining the concentrations and forms of mercury in the atmosphere. Two methods were compared in the paper as there has been controversy over the accuracy of one of the methods. *(He and Mason (2020) Comparison of reactive gaseous mercury measured by KCl-coated denuders and cation exchange membranes during the Pacific GEOTRACES GP15 expedition. Atmospheric Environment.)*

Tyler Griffin (grad student, Prof. J. E. Ward)

Recent publication comparing and discouraging the use of fecal sampling as a substitute of gut samplings for the blue mussel. *(Griffin et al. (2020) Direct Comparison of Fecal and Gut Microbiota in the Blue Mussel (Mytilus edulis) Discourages Fecal Sampling as a Proxy for Resident Gut Community. Invertebrate Microbiology.)*

All stories originally posted on October 5, 2020 by Patricia Myer