

ANNUAL REPORT FOR
THE COLLEGE OF MARINE SCIENCE
DEAN JACQUELINE E. DIXON

JANUARY 1 – DECEMBER 31, 2016

Locally Applied, Regionally Relevant, Globally Significant!

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THE VIEW FROM THE BRIDGE

The View from the Bridge



We are so proud to be a part of such a rapidly improving global research university focused on student success. USF has been recognized as a top 25 public research university as ranked by the National Science Foundation and has grown to become the 9th largest public research university in the nation with over 50,000 students, an annual budget of \$1.8 billion, and an annual economic impact of more than \$4.4 billion for the Tampa Bay region. This year the Chronicle of Higher Education ranked USF #1 in Fulbright awards. Go Bulls.

In the 50 years since its official beginning, CMS has expanded in size and capability and is internationally recognized as a leader in ocean science. There are now 26 faculty, ~100 graduate students, 47 full-time support personnel, and 48 temporary staff. CMS researchers have ~\$15M in annual research expenditures and a total endowment of ~\$18M.

This year is the 50th Anniversary of the college in its various forms. We just completed a wonderful celebration, which brought alumni and friends from around the world. Alumni held panels on career opportunities for graduate students and were the speakers at our Eminent Scholars Lecture Series. There were many opportunities for faculty, students, staff, and friends of all generations to reconnect.



The growth of the College of Marine Science occurred during a transformational period in the study of the solid and fluid Earth. The past 50 years of oceanography have seen at least 5 major revolutions in our understanding of global ocean systems and I would like to put CMS' scientific contributions into this context.

With respect to the solid earth, the pieces of the plate tectonics puzzle were falling into place in the 60's and 70's. Building on the bathymetric data collected during World War II as ships crisscrossed the oceans, new data on seafloor bathymetry, crustal structure, radiometric ages of rocks, seafloor magnetic stripes, locations of earthquakes and volcanoes, and the compositions of oceanic crust and accumulated sediments were synthesized into an elegant model involving rigid lithospheric plates moving on the earth's surface driven by 3D mantle convection. New

THE VIEW FROM THE BRIDGE

oceanic crust is continuously created at mid-ocean volcanic ridges above upwelling mantle divergent zones. Old oceanic crust and underlying mantle is continuously destroyed at deep ocean trenches, where oceanic crust and lithosphere are returned to the mantle in downwelling convergent zones. Thomas Pyle was at the forefront of seafloor mapping. Al Hine contributed to our fundamental understanding of continental margins and carbonate platforms.

Another revolution was taking place in our understanding of the 3D circulation in the ocean facilitated by Navy funding to help find enemy submarines and to make sure that ours remained hidden. This required detailed knowledge of the 3D temperature and salinity structure in the ocean, which was enabled by the development in the early 1960's of the CTD profiler by Neil Brown. Also around 1960, Henry Stommel and Klaus Wyrtki wrote seminal papers on the thermohaline circulation, and later, in 1991, Wallace Broecker published a synthesis called the Great Ocean Conveyor Belt that tied together physical, biological, chemical, and geological oceanography. Here at the CMS Bob Weisberg and Mark Luther were carrying out ground-breaking observational and modelling studies of the equatorial and tropical circulation, helping us to understand El Nino.

A third revolution involved the use of Earth-orbiting satellites to observe the ocean on a global scale. The second satellite ever launched by NASA (Explorer-1), in 1958, had a primary mission of observing the Earth. Seasat, launched in 1978, had as its primary mission to observe the ocean with an array of sophisticated instruments. Since those initial tentative steps, NASA and other international space agencies have launched hundreds of different Earth-focused satellite missions, all with a goal of understanding the entire fluid Earth system from the oceans to the top of the atmosphere. Starting in the 1990s with the implementation of the NASA Earth Observation System (EOS), measurements of important ocean parameters began on a regular basis. These include sea level, sea surface temperature, ocean color and chlorophyll, ocean vector winds, and even gravity, allowing scientists to observe the ocean at unprecedented resolutions. CMS has been at the forefront of using these satellite observations to study the ocean since its formation, starting with the hiring of Ken Carder, an expert in the use of optical satellites to observe ocean color and chlorophyll, in 1969. There are a half-dozen faculty at the college at the moment who are experts in one or more satellite techniques. Their accomplishments include detection and monitoring of eddies shed by the Loop Current in the Gulf of Mexico (Weisberg group), the measurement of global sea level rise with a precision of a few millimeters (Mitchum group), tracking of red tide, sargassum, and oil-spills (Hu, Muller-Karger and Weisberg groups), detection of coral whitening (Muller-Karger group), and measuring the rate of Greenland ice loss (Chambers group).

While satellites allow us to view the ocean on a very big scale, a fourth revolution involves examination of things that are very small. Even back in the days of Darwin, it was presumed that there must be small things, so called "infusoria", on which the small animals in the ocean would feed. But our knowledge of marine microbiology has come a long way since then. Although the presence of bacteria in the oceans was noted early on, scientists could only culture ~100 cells per milliliter – a number so small that their effects on biogeochemistry were assumed to be negligible. Advances in imaging combined with the application of DNA-binding stains in the late 1970s represented a huge breakthrough – demonstrating that the oceans contained approximately a million bacteria per milliliter. Considering the large volume of the world's oceans, this translates into 10^{29} bacterial cells in the ocean – about 6 orders of magnitudes more than the number of stars in the universe and mass greater than the mass of all the zooplankton and fish combined! We now know that half of the oxygen in every breath we take comes from photosynthetic marine microbes. John Paul and his students have been at the forefront of microbial research.

THE VIEW FROM THE BRIDGE

As scientific techniques improved, we began to start examining the oceans on even smaller scales, and in the late 1980s, it was shown that viruses are the most abundant biological entities on the planet, present at numbers 10x that of bacteria! In fact, if you stretched all of the tiny viruses in the ocean end-to-end, they would span a distance of 10 million light years! Finally, all living creatures contain DNA – the genetic information that makes them who they are. DNA sequencing is currently used for biological oceanography through all the trophic levels, from bacterial identification to fish forensics and tracking the locations of rare and elusive species. Mya Breitbart is the queen of marine viruses.

While we are on the topic of the very small, much progress has been made on our understanding of ocean chemistry, including the role of carbonate chemistry and trace elements, like iron. For example, Peter Betzer laid the groundwork in 1975 with his paper “The effect of corroded hydrographic wire on particulate iron concentrations in seawater”. It is hard to measure iron in seawater when floating in a big iron ship using tools on a big iron wire! The pioneering work of Bob Garrels, Bob Byrne, Kent Fanning, is being continued now by Kristen Buck and our newest faculty member, Tim Conway. One of my favorite recent discoveries by Mya Breitbart, Kristen Buck, and graduate student Chelsea Bonnain, is that viruses are able to invade microbes by disguising themselves as iron-ligand complexes. They call it the Ferrojan Horse hypothesis. Really cool stuff.

Now we stand at the cusp of a new revolution -- understanding the impact of humans on the planet. There is even a name for this new age – the Anthropocene – the time of man. Bob Garrels was one of the first to propose this idea. In the old days it was believed that the ocean’s capacity was infinite. We could take as much as we wanted out and put as much as we wanted into it and nothing would change. Many of you remember, like I do, watching the daily bags of trash being dumped over the side of the ship and floating away on the sea. We are now bumping up against limits of the system. Everyday there are headlines with disturbing news. Plastics are everywhere in the ocean and unfortunately in the bellies of marine birds and mammals. PCB has been measured at the bottom of the Marianas Trench. Oxygen minimum “Dead Zones” are expanding offshore of almost every major river. Increased CO₂ in the atmosphere has caused the ocean to become 30% more acidic. Corals are bleaching and the oceans are warming. And of course no one can forget the images of oil spewing into the Gulf of Mexico during the Deepwater Horizon Oil crisis.

From the very big to the very small, research by College of Marine Science faculty, students and staff is more important than ever. We are dedicated to understanding the impacts of fishing, red tide, oil drilling, changing ocean chemistry, and sea level rise related to society’s addiction to fossil fuels. We are at the forefront of understanding the interplay of physical, chemical, and biological processes that control the ocean ecosystem. I spoke of the very big and very small. Our Fisheries group study everything in between, with the work of retired professors Hopkins and Torres being continued by Murawski, Peebles, Stallings, and Ainsworth. Our Marine Resource Assessment Program is setting the agenda on ecosystem management approaches and preparing students for careers in environmental management. We are looking to long-term records in sediments for clues to future climate change. The rates of change today are unprecedented, even when compared to the most extreme spike we see in nature. We are developing new tools and to improve ocean observations. We are educating the next generation of marine scientists. And we are striving to communicate our science to the public and policy makers through our Science Festival and other community outreach.

COLLEGE OF MARINE SCIENCE SNAPSHOT

College of Marine Science Snapshot

The Establishment of the CMS!

As we celebrate our fifty-year anniversary, it is good to look back and see how far we've come as a prelude to the exciting research and education that was accomplished in 2016 and that continues today. The USF College of Marine Science began in 1967 as the Marine Science Institute of the University of South Florida and was located in an old U.S. Merchant Marine training station on what would become the 11-acre USF branch campus near the Bayboro Harbor in St. Petersburg, Florida. The first three faculty – Harold Humm (Director, and a marine phycologist), Thomas Hopkins (marine plankton and micronekton ecology), and Hugh Dewitt (ichthyology) – set up laboratories in that facility and began to mentor graduate students working toward master's degrees. By 1969 the group doubled in size and included Thomas Pyle (marine geology), Kendall Carder (optical/physical oceanography) and Ronald Baird (ichthyology). When Peter Betzer (chemical oceanography) joined the faculty in 1971, all of the major sub-disciplines of oceanography were represented, and the Institute was re-designated as the Marine Science Department within the USF College of Natural Sciences. It was later incorporated into the USF College of Arts and Sciences. In 2000, the Department formally became a separate USF College located on the USF St. Petersburg campus while reporting directly to the USF Provost on the main Tampa Campus.

In the 50 years since its official beginning, Marine Science at USF has greatly expanded in size and capability and is widely recognized as a leader in ocean science. There are now 26 faculty covering the sub-disciplines of oceanography and other earth sciences, ~100 graduate students, ~\$15 million in annual research, a total endowment of ~\$18 million, two Research Faculty, 12 Postdocs, 57 Research Staff and 20 Administration Staff.

We are strongly engaged with the community as a member of the St. Petersburg Marine Science District, a group of organizations including USF CMS, USFSP, Eckerd College, the U.S. Geological Survey, the Florida Fish and Wildlife Research Institute, Florida Institute of Oceanography, SRI International, NOAA Fisheries Service, the Tampa Bay Estuary Program, and others. The Marine Science District contributes to the economic well-being of St. Petersburg through employment of approximately 800



researchers, engineers, technicians and support staff (an estimated 75% of those employed have advanced degrees; at least 30% of those at the PhD level), an estimated annual payroll of \$64M, and an additional (external market) financial impact of ~\$30M annually.

COLLEGE OF MARINE SCIENCE LEADERSHIP TEAM

College of Marine Science Leadership Team

Jacqueline Dixon

Dean, College of Marine Science
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Dr. Jacqueline Dixon is Dean of the College of Marine Science at the University of South Florida. She received her bachelor's and master's degrees in geology from Stanford University in 1981 and 1983, respectively, and her Ph.D. in geochemistry from the California Institute of Technology in 1992. From 1992 through 2010, Dr. Dixon was at the University of Miami, where she served as Director of the Abess Center for Ecosystem Science and Policy's Undergraduate Program, Senior Associate Dean for the Life and Physical Sciences, and Interim Dean of the College of Arts and Sciences. She received an Early Career Development award from the National Science Foundation for excellence in research and education, and is internationally recognized for her research on submarine volcanoes and the role of volatiles in magmatic processes. In 2015, Dr. Dixon was elected Fellow of the American Association for the Advancement of Science.

Dr. Dixon serves as Chair of the Executive Board of the Consortium for Ocean Leadership and is a member of the NOAA Ocean Exploration Advisory Board. Within the community, she serves on the board of the Secrets of the Sea Marine Exploration Center and Aquarium, and as a member on the St. Petersburg Ocean Team, the St. Petersburg Downtown Partnership, and the St. Petersburg Chamber of Commerce Board of Governors.

Gary Mitchum
Associate Dean, College of Marine Science
University of South Florida
Ph.D., Florida State University, 1984
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Dr. Mitchum is presently a Professor of Physical Oceanography and the Associate Dean in the College of Marine Science at the University of South Florida. After receiving his Ph.D. from the Department of Oceanography at the Florida State University in 1985, he spent 11 years in the Department of Oceanography at the University of Hawaii, first as a postdoctoral researcher and then as a member of the research faculty and as the Director of the University of Hawaii Sea Level Center. He came to the University of South Florida in 1996. His research interests emphasize short-term climate changes, ranging from interannual variations such as ENSO, to decadal processes, to the problem of long-term sea-level rise. He has also done work on continental shelf dynamics, mesoscale eddy interactions with mean flows, internal tide generation and propagation, physical controls on fisheries variables, and storminess changes in the southeastern United States. Although he has used many types of data in his research, he is especially interested in analyses of tide gauge and satellite altimetric data, and notably proposed and developed the presently accepted method of estimating temporal drift in altimeters via comparisons with the global tide-gauge network.

COLLEGE OF MARINE SCIENCE LEADERSHIP TEAM

David Naar

Associate Professor, Associate Dean of Academic Affairs
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Dr. Naar is the Associate Dean of Academic Affairs in the College of Marine Science at the University of South Florida. He received his bachelor's degree in Geology with an emphasis in Geophysics from University of California, Santa Barbara in 1982, and his Ph.D. in Earth Sciences from Scripps Institution of Oceanography, at the University of California, San Diego in 1990. From 1990 until present, Dr. Naar has been at the University of South Florida's College of Marine Science as an assistant professor and an adjunct professor at the University of Rhode Island's Graduate School of Oceanography. In 1996 he became an associate professor and subsequently the co-director of the Center of Coastal Ocean Mapping. In 2012, he became the Director of Academic Affairs. His research funding in Marine Geophysics over this time period came from the National Science Foundation, Office of Naval Research, the United States Geological Survey, the American Chemical Society Petroleum Research Fund, and the National Ocean and Atmospheric Administration. He has been cited by the Journal for Geophysical Research for excellence in refereeing. He is internationally recognized for his research on microplate tectonics, plate motions, seamount chains, and seafloor mapping from deep ocean trenches to the shoreline, including mapping several marine protected areas from American Samoa to Florida. Dr. Naar has served on the site characterization panels for several scientific international Ocean Drilling Programs and on the United States Scientific Advisory Committee (USSAC).

Chris Schwint

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Chris Schwint is the Budget Director for the College of Marine Science. He received his BA in 1981 from USF. Worked for the US Department of Labor and the University of South Florida in Budget and Policy Analysis.

COLLEGE OF MARINE SCIENCE LEADERSHIP TEAM

Tim Trowbridge

Unit HR Administrator

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Tim Trowbridge is the Unit HR Administrator for the College of Marine Science. He received his bachelor's degree in business management and minor in leadership studies from the University of South Florida in 2008. Since that time he has been employed by the University of South Florida serving as the Unit HR Coordinator for the Student Affairs Shared Services Center from 2009-2011 and in the College of Marine Science from 2011-2012. In May 2012, Tim Trowbridge was promoted to Unit HR Administrator for the College of Marine Science and continues to serve in this role. He earned his Professional in Human Resources (PHR) certification in December 2013 and earned Certified Research Administrator (CRA-USF/basic) designation in August 2015.

Joseph Donnelly

Facilities Manager, College of Marine Science

University of South Florida

M.S., University of South Florida, 1986

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Mr. Donnelly is the Facilities Manager for the College of Marine Science at the University of South Florida. He received his bachelor's degree in marine biology from The University of West Florida in 1980 and master's degree in marine science from USF in 1986. From 1985 through 2006, he was an assistant/associate in research at CMS working with Dr. José Torres studying the biology and ecology of midwater fish and invertebrates. From 1988 to 1997 he also worked as an adjunct instructor in Earth Science and Oceanography at St. Petersburg Junior College (now St. Petersburg College). After recovering from a serious work-related accident in 2006, he took on the newly-created position of CMS Facilities Manager in 2008. Mr. Donnelly currently serves on several CMS committees (Space, Safety, and Computer) and is also a member of the USFSP campus Gold Team, which deals with all matters relating to the USFSP Campus Emergency Management Plan (CEMP).

E. Howard Rutherford

Director of Development

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E. Howard Rutherford holds a Bachelor of Science degree in Marine Chemistry from Eckerd College, St. Petersburg, FL and attended graduate school at USF CMS. He returned to CMS as Director of Development after a 13-year tenure as President/CEO with The Pier Aquarium d/b/a Discovery Center.

COLLEGE OF MARINE SCIENCE LEADERSHIP TEAM

Before his tenure at the aquarium, Howard was a research associate in the nutrient chemistry laboratory at USF CMS where he participated in research projects from the Bering Sea to the Arabian Sea to the Southern Ocean.

He has witnessed firsthand the value and fragility of the marine environment, fueling his passion to share these discoveries with the public. His influence extends beyond Tampa Bay as a leader in ocean science education reform. As founding Co-Chair, Howard helped to establish the [St. Petersburg Science Festival](#), and currently participates on the Science Festival Alliance (SFA) Advisory Council at MIT. The SFA Council oversees the activities of over 45 Festivals across the United States and Canada. Howard has served as President to the [National Marine Educators Association](#), a national organization powered by [17 individual, regional chapters](#) that provide the on-the-ground efforts that support and promote national initiatives in education and conservation such as [ocean literacy](#). He actively participates on the [City of St. Petersburg's Ocean Team](#), of which the College of Marine Science plays a major role.

EVENTS AND HIGHLIGHTS

Events and Highlights

FACULTY AWARDS:

- **Pamela Hallock Muller:** USF Outstanding Graduate Mentor of the Year Award
- **Frank Muller-Karger:** National Oceanographic Partnership Program Excellence in Partnering Award
- **Steve Murawski:** Earns largest of three grants (\$1 million) awarded by the National Academies' Gulf Research Program
- **Ernst Peebles:** Award of Tenure
- **Brad Rosenheim:** Award of Tenure



*President Judy Genshaft,
Brad Rosenheim, Dean
Jacqueline Dixon, and
Provost Ralph Wilcox*



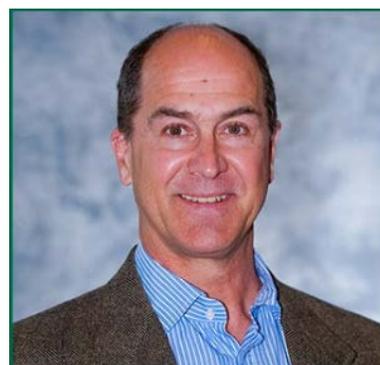
*Pamela Hallock Muller
Outstanding
Graduate Mentor Award*



*President Judy Genshaft,
Ernst Peebles, Dean
Jacqueline Dixon, and
Provost Ralph Wilcox*



*Steve Murawski Awarded \$1
Million Grant for New Study
on Oil Spill Impacts*



*Frank Muller-Karger selected
for the NOPP's Excellence in
Partnering Award*

EVENTS AND HIGHLIGHTS

STAFF AWARD:

- **Anita Thompson** received the USF Employee of the Year Award and the Outstanding Staff Award for 2016. Anita was nominated by ten people from the College! Anita will receive a monetary award in addition to a reserved parking space with a sign indicating “Employee of the Year.” The award is well deserved and recognizes her incredible competent and dedicated service to CMS.



*Provost Ralph Wilcox, Anita Thompson,
President Judy Genshaft*

NEW FACULTY:

- **Tim Conway** aims to understand the geochemistry of trace metals in the marine and earth system, and the role they play as micronutrients and/or toxins in marine biogeochemical cycles, with effects on the global carbon cycle. With the support of Dean Dixon, Dr. Conway acquired a Thermo Neptune Plus MC – ICPMS and Element XR high resolution ICPMD. This new instrument together with an ESI-Seafast flow through system for precise measurement of trace metal concentrations in seawater, provides Dr. Conway’s group with the ideal resources to utilize and develop these isotopic tracers in order to shed new light on the biogeochemical cycling of these metals to the ocean.

EMINENT SCHOLAR LECTURE SERIES:

Extreme Events in the ocean System, April 7 to 8, 2016 with four guest lecturers: Francisco Chavez, Monterey Bay Aquarium and Research Institute MBARI, “ Observing ocean ecosystems in a changing world”; Ellen Thomas, Yale University, “Life in the Deep Sea during Asteroid Impact and Carbon Cycle Upheaval”; Bill Johns, University of Miami, “Variability of the Atlantic Meridional Overturning Circulation: Surprises and Insights from the 1st decade of the US/UK RAPID Program”; and Curtis Deutsch, University of Washington, “Aerobic marine habitat in a warming climate: from microbes to macrofauna”.

EVENTS AND HIGHLIGHTS

ALUMNI SUCCESS:

- **Monica Cook**, Ph.D. 2015, recently published a manuscript in the journal *Water*. The manuscript, “Removal of six estrogenic endocrine-disrupting compounds (EDCs) from municipal wastewater using aluminum electrocoagulation” is open access in the Special Issue “Emerging Contaminants: Occurrence, Fate and Transport, and Removal.” Co-authors include Dr. Ted Van Vleet (CMS), Dr. Mya Breitbart (CMS), Dr. Erin Symonds (CMS), Dr. Armando Hare (USFSP) and Bret Gerber.
- **Libby Carnahan**, MS 2002, Florida Sea Grant agent for UF/IFAS Extension in Pinellas County, has been awarded the 2016 Don Sweat Sea Grant Extension Award.
- **Inia Soto Ramos**, Ph.D. 2007, is a Postdoctoral researcher for Concorde. Inia was featured on the Concorde website for work with satellite imagery, geographical models, and in situ data to understand the physical and biological changes freshwater undergoes as it enters the Gulf from area rivers.
- **Shihadah ‘Shay’ Saleem**, MS, 2007, is a Senior Museum Educator and Coordinator of GOALS (Greater Opportunities Advancing Leadership and Science) for Girls at the Intrepid Sea, Air & Space Museum in New York City. Throughout the year she provides teens, families and communities with opportunities in STEM (science, technology, engineering and math) programming, from free workshops, paid internships and summer experiences.
- **Carrie Wall**, Ph.D. 2008, research was featured in a cover story of December 2016 issue of *Earth & Space Science News*.
- **Brian Barnes**, Ph.D., 2009, represented Dr. Chuanmin Hu’s Optical Oceanography Lab during the 3rd Annual Global Achievement Awards and Fulbright Recognition Breakfast hosted by USF World during which their lab won the USF Global Achievement Award. Global Achievement Awards are competitively selected by a panel of their peers and represent the highest standards of scholarship and professionalism.



Dr. Roger Brindley, President Judy Genshaft, Dr. Brian Barnes, Provost Ralph Wilcox

ENDOWED GRADUATE STUDENT FELLOWSHIP LUNCHEON:

October 2016 began with a lunch to celebrate our endowed graduate student fellowships and awards. Details are provided in the Development section.

EVENTS AND HIGHLIGHTS

ST. PETERSBURG SCIENCE FESTIVAL:

In mid-October, we proudly participated in the growing St. Petersburg Science Festival held concurrently with the Florida Fish and Wildlife Marine Quest. CMS hosted ten out of 114 exhibits ranging from CSI Activities in the Gulf of Mexico to Symbiosis in the Sea! The festival drew in some 25,000 public visitors, including a Sneak Peek Day for 1,500 4th and 5th grade students and teachers.

For the second year in a row, festival evaluators used iPads to collect all attendee data with a survey instrument developed by the leaders of 24 national science festivals that participate in EvalFest, a five year NSF grant to fund a community of practices designed to meet the evaluation-related needs of the growing science festival sector in the United States. One of the most important improvements noted was that the St. Petersburg Science Festival has been able to significantly increase attendance among Black/African Americans and Asian Americans. In addition, the St. Petersburg Science Festival received a mini-grant through EvalFest to examine how children ages 4 – 13 engaged with the exhibits. Unobtrusive observation will enable our evaluators to assess interaction and engagement with festival exhibits beyond the self-reporting survey answers. The St. Petersburg Science Festival will lead the observation and tracking of child exhibit engagement at 2 additional science festivals- The Jacksonville Science Festival and the Philadelphia Science Festival.



Regional Chancellor Sophia Wisniewska, Baynews 9 Chief Meteorologist Mike Clay, Atomic Tom and Dean Jackie Dixon open the 2016 St. Petersburg Science Festival

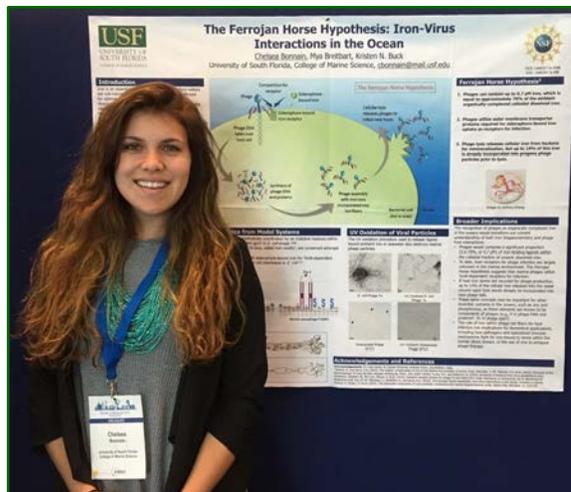
Highlighted Research

Ferrojan Horse Hypothesis:

Mya Breitbart, Biological Oceanography

Iron is an essential micronutrient for phytoplankton that is required for photosynthesis and respiration. Insufficient iron has been shown to limit phytoplankton growth in large regions of the surface ocean, and correspondingly, iron cycling is directly linked to carbon cycling in much of the marine environment. Nearly all iron in seawater (>99%) exists as complexes with organic molecules called ligands, which govern the concentration of iron dissolved in the water and the bioavailability of that iron to phytoplankton. However, despite the importance of iron-binding organic ligands, their sources and identities are largely unknown. Viruses, the majority of which are phages (viruses that infect bacteria), are extremely abundant in seawater and are in the same size fraction as dissolved iron. Recent evidence that non-marine phages contain iron as part of their structures has led Drs. Kristen Buck and Mya Breitbart, along with Ph.D. student Chelsea Bonnain to propose the Ferrojan Horse Hypothesis (Bonnain, C, M Breitbart, KN Buck (2016). The Ferrojan Horse Hypothesis: Iron-Virus Interactions in the Ocean. *Frontiers in Marine Science*. 3: 82).

Building upon evidence from non-marine model systems demonstrating the presence of iron ions in phage tail proteins and phage utilization of cell surface receptors for siderophore-bound iron, these USF-CMS researchers have recently received an NSF EAGER award that combines field and laboratory-based experiments to test the following three hypotheses regarding iron-virus interactions in the oceans: (1) Iron incorporated into phage tails



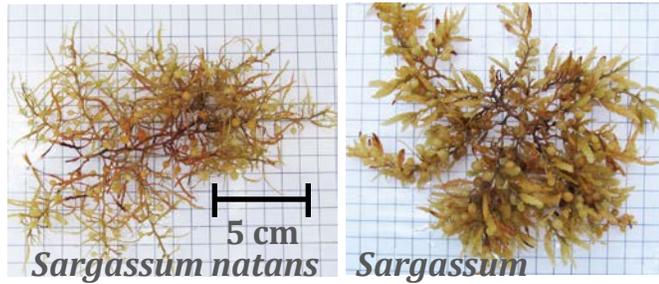
Ph.D. student Chelsea Bonnain presenting her research at the Viruses of Microbes 2016 conference in Liverpool, UK.

originates from bacterial cell reserves, reducing the amount of iron available for remineralization upon lysis; (2) Phages constitute important iron-binding ligands in the oceans, accounting for a substantial portion of organically complexed colloidal dissolved iron; (3) Marine phages compete with siderophore-bound iron for uptake receptors on the bacterial cell surface and use iron in their tails as a Trojan horse for infection. Initial calculations predict that that phages could account for up to 70% of the colloidal fraction of organically complexed dissolved iron in the surface ocean; therefore, this project is critical for advancing knowledge of trace-metal cycling as well as phage-host interactions. Additionally, if a portion of the cellular iron thought to be released from bacterial cells for remineralization following lysis is already incorporated into phage tails, then these findings will have significant implications for oceanic biogeochemical models. As the first study to examine the biogeochemical impact of trace elements contained within the structure of highly abundant marine phage particles, successful completion of the proposed research will be transformative for biological and chemical oceanography and have far-reaching implications for other fields, including human health where iron availability plays an important role in microbial pathogenesis.

Sargassum is both good and bad

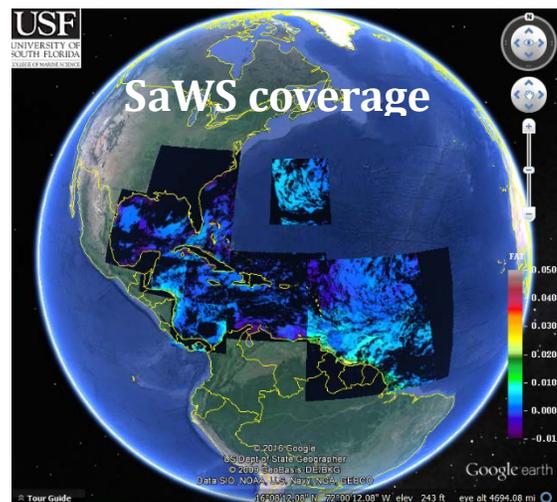
Chuanmin Hu, Physical Oceanography

Another of the research highlights at CMS during 2016 is the work on *Sargassum* detection and tracking by Dr. Chuanmin Hu's Optical Oceanography Lab. *Sargassum* is one type of brown macroalgae (seaweed) abundant in the Atlantic, Caribbean Sea, and Gulf of Mexico. The two most abundant holopelagic species found in these oceans are *Sargassum natans* and *Sargassum fluitans*, which spend their entire life cycle in surface water and reproduce solely by vegetative fragmentation. They have tough, leathery, densely branched thalli, which are comprised of axes, blades, and air bladders. Both *S. natans* and *S. fluitans* serve as unique and important habitats for a diverse assemblage of marine animals providing food, shade, and shelter (from predators) to fish, shrimp, crabs, and turtles. They can also represent a marine resource for uses such as biomass for food and fuel. *Sargassum* in the ocean is therefore regarded as the "golden floating rainforest" by the Sargasso Sea Alliance. On beaches *Sargassum* can serve as fertilizer for sand dunes ecosystems (which help protect shoreline stability). However, excessive amounts of *Sargassum* on beaches in populated areas represent a nuisance and must be physically removed. Onshore *Sargassum* decomposition smells like rotting eggs as they release hydrogen sulphide gas. It attracts insects and causes many environmental (e.g., smothering turtle nesting sites, sea turtle mortality, fish kills) and economic problems such as losses in tourism. Such beaching events are well known in the northern Gulf of Mexico (especially Texas), the Sargasso Sea, and the northern Caribbean islands, and in recent years many residents in the southern Caribbean, West Africa, and Brazil have also experienced frequent *Sargassum* beaching events, resulting in both environmental and economic problems. In 2015, excessive *Sargassum* beachings along the western Caribbean coast threatened the coastal economy in Mexico where it became a cabinet-level crisis and the Mexican Navy was called to take actions.



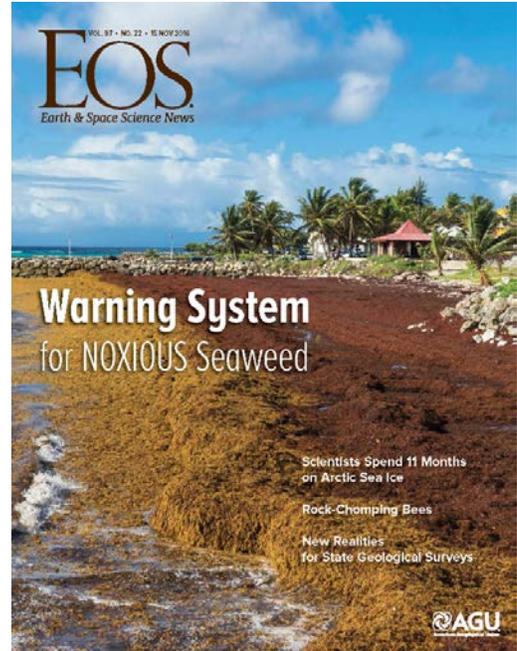
Sargassum Watch from space

Although it is critical to have accurate knowledge of *Sargassum* abundance, origin, distribution, transport, and their short-term changes and long-term trends for a variety of purposes including beach management, due to lack of sufficient measurements of this patchy organism in the vast ocean our knowledge is still very limited. As a first step to fill these knowledge gaps, in 2016 Dr. Chuanmin Hu led his Optical Oceanography Lab established a satellite based *Sargassum* Watch System (SaWS, <http://optics.marine.usf.edu/projects/saws.html>) to produce



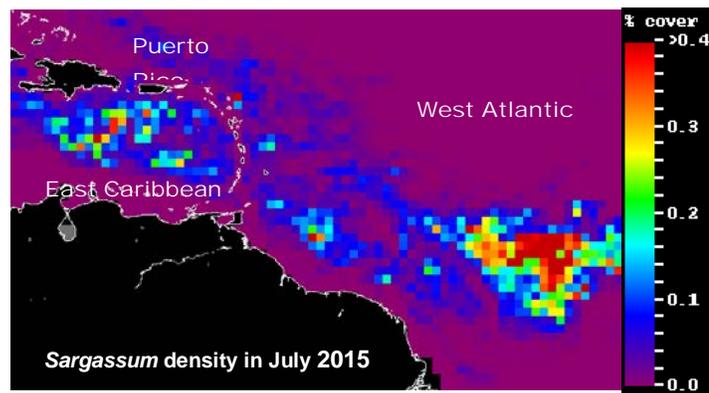
HIGHLIGHTED RESEARCH

satellite imagery specifically tailored for detecting and track *Sargassum* in the Gulf of Mexico, Caribbean, and the Atlantic. Combined with surface ocean currents, these near real-time imagery provided first-hand knowledge on the locations of large *Sargassum* rafts and their movement directions, thus serving as a prototype early warning system that has been used by many local agencies and groups to monitor and prepare for *Sargassum* beaching. For example, one company based in Guadeloupe used this system for prepare routine reports to local government for probability of *Sargassum* beaching. These collaborative efforts were recently highlighted in a feature article led by Dr. Hu, which appeared on the cover page on AGU's EOS magazine. For these achievements, Dr. Hu's group won the USF Global Achievement Group Award.



In addition to these community service efforts, in 2016 Dr. Hu's group has also developed algorithms to quantify *Sargassum* abundance in the Atlantic and Caribbean, from which a complete set of *Sargassum* distribution maps between 2000 and 2016 have been generated for the first time. These maps not only showed *Sargassum* seasonality and inter-annual changes but also long-term trends, thus providing fundamental information on understanding *Sargassum* transport and response to climate variability. For example, using these maps, his group has developed a forecasting tool to predict *Sargassum* blooms in the Caribbean Sea based on conditions in the Atlantic. These results have been published in the journal Remote Sensing of Environment and Geophysical Research Letters.

While significant progress has been made in 2016 from these satellite-based observations, there is still a lot to learn through biological and ecological understanding as well as integration of observations of oceanographic and climate data into forecasting models. For example, how much total biomass is in a certain region? What is its chlorophyll, carbon, nitrogen, phosphorus, and iron content? How



does the associated fauna community vary between geographic regions and *Sargassum* species or morphological forms? How does *Sargassum* influence the oceanic carbon and nutrient cycles? What environmental factors drive its productivity, growth, and distribution? How does *Sargassum* respond to global change, such as increasing reactive nitrogen and CO₂? How do ocean warming and changes in ocean currents affect *Sargassum*? Without addressing these research questions it is difficult to explain the sudden increases in tropical Atlantic and Caribbean *Sargassum* blooms after 2011. Based on the results obtained in 2016, Dr. Hu worked with others to develop 2 NASA and 1 NOAA proposals to continue research and application on *Sargassum*; all were selected for funding. With these funded activities to study *Sargassum* ecology, biogeochemistry, and how *Sargassum* responds to environmental changes, our knowledge of *Sargassum* and our short- and long-term predictive capabilities are expected to improve significantly in the near future.

RESEARCH OVERVIEW

Research Overview

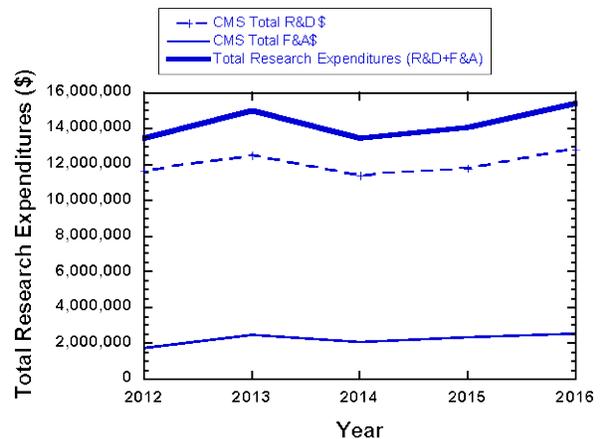
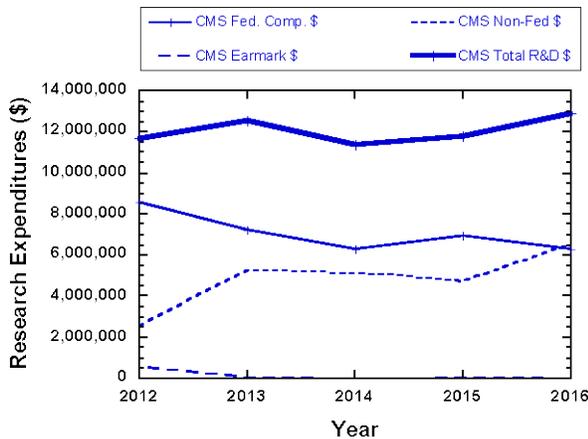
Research Activities in the Dean's Office

Gary Mitchum continues his work as the USF lead for the Florida Climate Institute (FCI), a consortium of nine Florida universities seeking support for climate-related research. The FCI structure identifies a lead at each institution and a second person to sit on the state-wide executive board. Richard Berman from the Patel College of Global Sustainability has agreed to fill this second role. The major undertaking of the FCI in the past year has been the development of a climate encyclopedia for Florida, which will be published by the University Press of Florida. The breadth of topics covered is very large and draws on expertise from all of the FCI institutions. Gary is serving on the editorial board for this book and is also co-lead author for one of the chapters. Other USF authors are Don Chambers and Jennifer Collins. Gary has also begun attending meetings with the Southeast Florida Climate Compact members to investigate research opportunities for the USF chapter of the FCI.

RESEARCH PRODUCTIVITY

The research profile of the college has improved despite increased competition for external grants in general, and especially stiff competition for federal grants. In 2016, our total research expenditures increased to ~\$15.4 M, with ~\$12.9 M in direct research expenditures and ~\$2.5 M in indirect cost recovery. As expected for a research-intensive unit, our faculty have some of the highest per faculty research performance metrics in the university. Over the past year we averaged over \$600K of total research expenditures per full-time equivalent tenure-earning faculty member.

Anita Thompson, our unit research administrator, continues to keep the research enterprise running smoothly, receiving accolades from everyone she interacts with.



Faculty Highlights

Below are highlights from faculty, along with their students and staff, and accomplishments in 2015. Publications for CMS faculty are listed in a separate section.

Cameron Ainsworth

In 2016, Dr. Ainsworth and his laboratory pursued two projects. The first was to better understand ecosystem effects of the Deepwater Horizon oil spill. Past publications describe an Atlantis ecosystem model, characterize species distributions and the Gulf food web, and present new dose response models. In 2016, the oil spill study reached a turning point as first simulation results were submitted to the top-tier journal *Nature Communications*. This paper reveals how starvation effects propagated damage from the spill over a wide area and made predictions of fisheries impacts yet to come. Dr. Ainsworth is contributing to oil spill studies in Prince William Sound, the Beaufort Sea and the Niger Delta. The second objective was to invent better ways to manage fishery resources. In 2016, Dr. Ainsworth and his student published a multi-species management strategy evaluation, which will be taught in an upcoming ICES short course. Also in 2016, Dr. Ainsworth and student contributed to NOAA's Integrated Ecosystem Assessment program with a paper evaluating ecological indicators for use in management. He continued with two studies characterizing larval fish dynamics and its influence on protected area siting strategies. Dr. Ainsworth also embarked on new studies on the contribution of artificial reefs to fisheries management and a global meta-analysis of climate change impacts. Oil spill and fisheries management projects were presented at the GOMRI Conference and NCER Conference, respectively. Dr. Ainsworth was nominated in 2016 for the prestigious Rosenstiel Award from the University of Miami for outstanding contributions to the field of ocean science.

Mya Breitbart

Dr. Mya Breitbart's microbial ecology and genomics laboratory had an extremely successful year, publishing 8 peer-reviewed scientific manuscripts and obtaining funding for several new research projects. Notable research progress includes development of methods for quantitative analysis of marine viral communities, determining the impact of membrane vesicles on viral abundance estimates, establishing a new viral indicator for tracking fecal pollution along the southeastern coast of Florida, testing the ability of electrocoagulation to remove estrogenic endocrine-disrupting compounds from wastewater, determining the risks associated with indirect wastewater reuse in Bolivia, and the discovery of new plant viruses. The Breitbart lab remains at the forefront of research into small, single-stranded DNA viruses in the oceans, publishing an invited review article on this topic in 2016 and advancing new virus taxonomy proposals. Along with chemical oceanographer Dr. Kristen Buck, Dr. Breitbart's lab advanced a transformative new idea, "The Ferrojan Horse Hypothesis", which links marine viruses to trace metal biogeochemistry. This hypothesis was published in *Frontiers in Marine Science* in 2016, and Drs. Buck and Breitbart were awarded an EAGER grant from the National Science Foundation to continue work on this topic. Dr. Breitbart and her lab members gave a total of 22 presentations at scientific conferences in England, Peru, and throughout the United States in 2016. Finally, the Breitbart lab participated in numerous outreach activities to share their research with the public, including the 2016 Saint Petersburg Science Festival.

FACULTY HIGHLIGHTS



The Breitbart Lab

2016



Kristen Buck

Dr. Kristen Buck had three active NSF grants in 2016, and spent 40 days at sea with her lab in the Southern Ocean in Fall 2016. Buck was invited by Ocean Carbon and Biogeochemistry (OCB) and GEOTRACES to present her work on iron-binding ligands at a synthesis meeting held at Columbia University's Lamont Doherty Earth Observatory in August 2016. She wrote a summary of this work in an invited article for the OCB summer newsletter. She also contributed to an invited review in *Nature* in 2016. Buck gave two additional invited seminars in 2016, at Scripps Institution of Oceanography and in the USF Environmental Research Interdisciplinary Colloquium seminar series. Buck also chaired a special session at the joint AGU/ASLO/TOS Ocean Sciences Meeting in New Orleans in 2016. Dr. Buck accepted three new graduate students in 2016, adding to the three PhD students and two MS students she currently supervises. One of these PhD students, Chelsea Bonnain, is co-supervised by Dr. Mya Breitbart. Buck also supervised two postdocs in 2016. The graduate student she co-supervised at the University of Plymouth (UK), Matt Fishwick, which she took on in her previous position at the Bermuda Institute of Ocean Sciences, successfully defended his PhD in 2016. Dr. Buck also supervised two undergraduate students in 2016, one of whom is an underrepresented minority that she took on her Southern Ocean cruise. Dr. Buck also co-taught the Chemical Oceanography core course in Spring 2016. Dr. Buck served as a guest editor for a special issue in *Frontiers in Marine Science* in 2016 for 21 additional manuscripts related to the Scientific Committee on Oceanic Research (SCOR) working group she co-chaired from 2012-2016. Dr. Buck also completed her first year of service on the Editorial Board for *Limnology and Oceanography: Letters* as an Associate Editor in 2016. She was also invited in 2016 by TOS to serve as Co-Chair of the 2018 Ocean Sciences Meeting and Chair in 2020.

Robert Byrne

Dr. Byrne described the development of a novel, portable carbon system sensor for measurements of dissolved inorganic carbon, total alkalinity and pH in freshwater and marine systems and patent protection on this work has been filed through USF Patents and Licensing. Two National Science Foundation proposals were funded in 2016 with Dr. Byrne as the sole PI on one and the USF PI on the second, which was a multi-institutional proposal. Dr. Byrne currently has four funded NSF grants as well as grants from USGS and NOAA.

Don Chambers

Dr. Chambers, along with his student and post-doc, published two significant papers last year in the *Journal of Geophysical Research-Oceans*, a leading journal of physical oceanography and geosciences. Thomas Wahl (a post-doc) and Dr. Chambers published a paper linking multi-decadal variations in extreme sea level (e.g., storm surge) in the 20th Century around North America to climate signals like El Niño, the Pacific Decadal Oscillation, and the Atlantic Multidecadal Oscillation. This has important implications for modeling future sea level extremes over the next century. In the second paper, Dr. Chambers and his student examined changes in the Antarctic Circumpolar Current (ACC), testing a hypothesis that ACC transport should increase since winds over the

FACULTY HIGHLIGHTS

Southern Ocean have increased over the last decade. Using a combination of satellite and in situ measurements, they found that the transport varied with the winds at interannual (1-3 year) periods, but there was no significant trend over the last decade, at least in the upper 2000 m of the ocean. Finally, Dr. Chambers was a co-author of a book entitled *Sea Level Rise in Florida: Science, Impacts, and Options*. The book was written for a general audience and has received outstanding reviews from academics and non-scientists alike.

Kendra Daly

Dr. Daly's paper on oil-associated marine snow was highlighted on the Gulf of Mexico Research Initiative website and by the ECO- Environment Coastal & Offshore magazine. The impact of marine snow aggregates, which are natural detrital particles in the ocean, on oil sedimentation was one of the most important scientific discoveries resulting from the Deepwater Horizon oil spill. Information on this process will be integrated into decision tools for future oil spill response efforts.

Jacqueline Dixon

Dr. Dixon was honored as an American Association for the Advancement of Science (AAAS) Fellow at the February meeting in Washington DC. She served as a Tuve Fellow at the Department of Terrestrial Magnetism, Carnegie Institution of Washington during the months of March and April. As a Tuve Fellow, she focused on manuscript development, mentored post-doctoral fellows, and gave an invited seminar. The manuscript, "Light Stable Isotopic Compositions of Enriched Mantle Sources: Resolving the Dehydration Paradox" was submitted in November and is now in revision. Jackie was elected Chair of the Board of Trustees for the Consortium of Ocean Leadership and serves on the Federal Advisory Board for NOAA's Ocean Exploration Program.

Boris Galperin

Dr. Galperin's recent PhD graduate, Dr Esa-Matti Tastula, won the prestigious Sackett Prize for Innovative Research that recognizes demonstrated excellence in a completed research project which, in fact, was his PhD dissertation. The last of the four papers resulting from Dr. Tastula's dissertation appeared in ***Quarterly Journal of the Royal Meteorological Society***. Dr. Galperin continued his collaborative research with the experimental groups at the University of Rome and the University of Oxford and extended it to the University of Turin. The experimental group has started a series of experiments in the fast rotating annulus at the University of Turin, with the goal to identify, quantify and reproduce major unknown physical processes taking place in the atmospheres on giant planets. Dr. Galperin also made invited keynote presentations at the International Conference on Numerical Weather Prediction at the Jeju Island, South Korea, and the IMA Conference on Turbulence in Honour of Lord Julian Hunt's 75th Birthday, at King's College, Cambridge University, UK. Further development of the analytical theory of rotating turbulence allowed Dr. Galperin to explain important aspects of the phenomenon of super-rotation in the atmosphere of Venus. Two papers were published in the leading journals in Fluid Dynamics, ***Journal of Fluid Mechanics*** and ***Physical Review E***. and a new research proposal has been selected by NASA for funding.

David Hollander

Dr. David Hollander had a very successful year professionally as marked by his promotion to full Professor in the CMS and being awarded a highly prestigious University Guest Professorship position at the world-acclaimed

FACULTY HIGHLIGHTS

Swiss Federal Institute of Technology (ETH) in Zürich, Switzerland. Dr. Hollander spent nine months at the ETH (May 2016-January 2017) where he taught a newly developed course *"Science and Consequences of Marine Oil Exploration in Frontier Environments"*, conducted research at the ETH's state-of-the-art Accelerator Mass Spectroscopy facility, and presented invited lectures on the Deepwater Horizon Oil Well Blowout at academic institutions, international governmental programs (i.e., World Bank in Geneva) and at conferences throughout Europe. Dr. Hollander's research productivity was evidenced by the publication of 13 peer-reviewed articles (9 additional manuscripts in review), and the presentation of over 20 talks at national and international meetings. In addition, Dr. Hollander led a research expedition along the Mexican Gulf coastline, from the Yucatan to just south of the Mexican-US board, in search of coastal deposits of aged oil-tar associated with the 1979 IXTOC oil well blowout in the Bay of Campeche. Dr. Hollander and his research team were highlighted in the recently released documentary film entitled *"Dispatches from the Gulf"*, a new episode in the Journey to Planet Earth Series. Dr. Hollander continued to guide Gulf oil spill research as the Chief Scientific Officer of C-IMAGE (Center for the Integration, Modeling and Analyses of the Gulf Ecosystem) consortium, a \$20 million international consortium funded by the Gulf of Mexico Research Initiative (GoMRI) and as recently elected Chair of MOSSFA (Marine Oil Snow Sedimentation and Flocculent Accumulation Working Group).



View of a traditional Swiss mountain farm house set in an Alpine terrain with rolling green pastures and rock mountain peaks (Simmital, Bernese Oberland, Switzerland).



Dr. Hollander (center) Conducting field work (with USF post-docs and staff and with faculty from C-IMAGE partner institutions) at sunset on the Mexican coastline along the Bay of Campeche in search of beached oil and tar residue from the 1979-1980 IXTOC -1 Oil spill.



Close-up view of a new type of rock discovered along the Mexican Gulfcoast that we named a "Tar-glomerate". Comprise of pebbles, cobbles and boulders, a rocky shoreline, that has been cemented together with oil from the 1979-1980 IXTOC-1 oil spill.



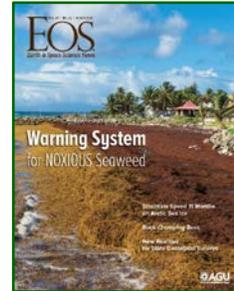
Dr. Hollander's (center) group used this style of boat "Ponga" to access the Mangrove Shorelines along the Bay of Campeche, Mexico, in search of buried and preserved oil and tar deposits originating from the 1979-1980 IXTOC-1 oil spill.

Chuanmin Hu

Dr. Chuanmin Hu published 30 peer-reviewed articles. Of particular importance are those focused on the *Sargassum* seaweed, where he and his group developed the first-ever complete *Sargassum* maps in the Dr. Chuanmin Hu published 30 peer-reviewed articles. Of particular importance are those focused on the *Sargassum* seaweed, where he and his group developed the first-ever complete *Sargassum* maps in the Caribbean and Central Atlantic. Dr. Hu's group also implemented a satellite-based *Sargassum* Watch System (SaWS) to help local groups and residents to monitor and prepare for *Sargassum* beaching. These activities, together with efforts

FACULTY HIGHLIGHTS

from his colleagues, were highlighted in a feature article led by Dr. Hu, which appeared on the cover page on AGU's EOS magazine. For these achievements, Dr. Hu's group won the USF Global Achievement Group Award. Furthermore, based on these works, Dr. Hu developed and submitted two proposals to NASA to continue research on *Sargassum*; both were funded, with a total amount of > \$1M to Dr. Hu's group.



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Xinfeng Liang

Dr. Xinfeng Liang started his position at USF at the beginning of 2016. In the past year, he made much progress in building his research lab and working with USF Research Computing he built a computer facility to conduct climate and ocean research. He recruited his first PhD student and he made progress in both research and teaching in the past year. Dr. Liang, along with Dr. Lisan Yu from Woods Hole Oceanographic Institution, published an important study on the air-sea heat exchange over the global warming "hiatus" period in *Journal of Climate*, one of the top journals in climate science. Together with colleagues from the Ocean University of China, Dr. Liang co-authored two papers on mesoscale eddies and mixing in the South China Sea. These papers were published in *Journal of Geophysical Research* and *Journal of Physical Oceanography*, two leading journals in physical oceanography. Dr. Liang also developed an introductory course about climate change and climate variability, aiming to teach the college's students the observational evidence, the mechanisms and the projections of climate change. Dr. Liang was PI or co-PI for five proposals submitted to federal agencies (e.g., NSF, NASA). One of these was selected.

Mark Luther

Dr. Luther and a long-term research associate, Dr. Steven Meyers, recently published research on changes in circulation and residence time in Tampa Bay due to alterations of the geometry of the bay from construction of causeways and bridges, deepening of shipping channels, and dredging/filling around the coastline. Residence time is increased near causeways and filled sections of the bay but is decreased in deepened shipping channels, due to an increase in estuarine overturning circulation, especially during higher fresh water input periods. Dr. Luther has continued to strengthen relationships between the University and the regional maritime transportation community as he builds the new Center for Maritime and Port Studies. The introductory course for the program, "Sustainable, Resilient, and Secure Port Operations and Infrastructure" (abbreviated as "Port Sustainability") has been taught for four semesters to excellent reviews. Dr. Luther has submitted the course to the Office of Graduate Studies for formal approval as a continuing course (it has been taught under "Special Topics"). Dr. Luther met with scientists from the Univ. of Havana and other Cuban officials in Havana, Cuba on Sept. 27-29, 2016, to discuss ocean observations in support of developing their nation's ports and marinas in anticipation of opening relations between our countries.

FACULTY HIGHLIGHTS

Gary Mitchum

One of the reasons that many people and some scientists doubt that climate change and sea level rise is really happening is that the forecasts of future conditions are based on highly complex computer models rather than straightforward data analyses. This is because up to this point the magnitude of the changes forecast by the models is too small to be detected in the data with statistical reliability. If we could show that the expected changes are actually happening via direct observation, then the debate could change from “Is it real?” to “What should we do about it?” It is fair to ask that the data show things directly, and we think that in the past year our team has detected, from the data, the increase in the sea level rise rate that is predicted by the models. In other words, we can now show that both models and data confirm that we need to take climate change seriously. My role in this work is focused on the statistical analyses. This work has not been published yet (a paper is in progress), but preliminary results have been presented at an international science meeting.

Pamela Hallock Muller

Dr. Hallock Muller graduated four PhDs, Kathryn Wirt Ames, Kwasi Barnes, Michael Martinez-Colon, and Natasha Mendez Ferrer, as well as two Master’s students. She also served on dissertation advisory committees of two additional CMS graduates and one in Saudi Arabia. Dr. Hallock Muller was recognized by the USF Graduate School as the 2016 Outstanding Graduate Mentor. Her publication rate was reduced somewhat by her duties as Editor for the *Journal of Foraminiferal Research*, a quarterly journal published by the Cushman Foundation for Foraminiferal Research. Nonetheless, she co-authored two papers and a book chapter with her students or graduates, and co-authored two other peer-reviewed papers and one non-peer reviewed book chapter. She is co-author of several papers in press (1), accepted (2), and submitted (4). Dr. Hallock Muller and her students presented nine papers at national (Geological Society of America Annual Meeting) and international meetings (International Conference on Palaeoceanography, International Coral Reef Symposium). Although she only taught one formal class and presented lectures in three others, her mentoring responsibilities occupied much of her time. Professional service, in addition to editorial responsibilities, included continued membership on the International Scientific Advisory Board for the Leibniz Center for Marine Tropical Ecology (ZMT), in Bremen, Germany, and as a member of the Scientific Committee for Forams 2018 – International Symposium on Foraminifera to be held in Edinburgh, Scotland. She also served as lead organizer and chair for a joint oral and poster session at the 13th International Coral Reef Symposium, Honolulu, Hawaii, in June 2016.



Dr. Hallock Muller (Center) with two of her doctoral students at graduation (Dr. Natasha Mendez-Ferrer (Left) and Dr. Michael Martinez-Colon (right))

Frank Muller-Karger

Dr. Muller-Karger published 15 peer-reviewed papers on topics ranging from ocean policy to climate change, and two more have been accepted for publication. He recorded a one-hour program for Discovery Channel/Science Channel, What on Earth (WAG TV producers) that will be aired in 2016. Dr. Muller-Karger coordinated partner efforts in community engagement activity for the "Clean Community Clean Coast partnership" with the City of St. Petersburg. The sculpture in St. Petersburg (Current Collections:

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<http://news.usf.edu/article/templates/?a=6573&z=219>) went on a tour of several U.S. cities and was brought back to St. Petersburg. Dr. Muller-Karger's group continued to develop satellite-derived products for use in shallow and deep coastal waters. These were used to guide the first official NOAA cruise around Cuba in May 2015. A detailed study of the satellite data also clearly identified the Amazon River plume as a source of water quality issues around the Virgin Islands, and this helped interpret NOAA reef fish data for the northern Caribbean Sea. Dr. Muller-Karger's website continues to be a resource to the community through which they access scientific information about the CARIACO time series and satellite images. The CARIACO Ocean Time Series that was created by Dr. Muller-Karger celebrated its 20th year of monthly cruises and continued funding from the NSF and the Venezuelan government. A major ecological shift in the Caribbean Sea has been documented, which is related to the largest temperature and salinity anomalies observed in the Atlantic Ocean in a century. Finally, Dr. Muller-Karger's Belmont Forum research (METROPOLE) on values and beliefs that affect climate change adaptation policies has successfully completed workshops in Florida, the UK, and Brazil.

Steve Murawski

Dr. Murawski served as the Principal Investigator on grants totaling over \$5.3 million in expenditures in 2016. As PI and leader of the Center for Integrated Modeling and Analysis of Gulf Ecosystems (C-IMAGE-II) he oversaw the activities of 199 researchers at 17 participating institutions. Additionally, he was PI on a large grant from the National Fish and Wildlife Foundation to map and classify habitats on the West Florida Shelf. During 2016, Murawski submitted seven new grant proposals totaling over \$51 million. Of these, one was awarded and five are pending. As part of his laboratory's research, Dr. Murawski was Chief Scientist on the 40-day "OneGulf" cruise aboard the R/V *Weatherbird II*, sampling fish and sediments while circumnavigating the Gulf of Mexico. Dr. Murawski co-organized two sessions at the 2016 Gulf of Mexico Oil Spill and Ecosystem Conference in Tampa, where he also gave two papers. Additionally, he co-organized a session at the 2016 Ocean Sciences Meeting (in New Orleans). Overall, he gave 14 major talks and addresses, and published, or has in press, six papers. Murawski served on the NOAA Fleet Independent Review Team, looking at ship re-capitalization over the next several decades. He also served on the National Academies' Ocean Studies Board, serving as the Chair of the Fisheries Sub-Committee. Murawski organized and planned a May 2017 expedition to the waters off Cuba with a team from USF and the University of Havana. He also supervised the activities of eight graduate students and served on committees of an additional 10 students.

David Naar

Dr. Naar, his students, and his colleagues submitted two manuscripts for publication, one of which forms a chapter of Josh Kilborn's PhD dissertation. It was co-authored with Drs. David Jones and Ernst Peebles and will be published in 2017. Assistant Director, Ms. Brittany Sheehy, also published a paper on best practices of graduate education based on the practices developed over the past several years at the College of Marine Science's Academic Affairs and Dean's Office. This publication will also serve as a chapter in Ms. Sheehy's PhD dissertation at the College of Education. Dr. Naar has joined with Dr. Muller-Karger and Mr. Bernard Batson from the College of Engineering to improve inclusion and diversity at the College of Marine Science graduate program.

John Paul

A major accomplishment is a start-up company, PureMolecular LLC, a USF Technology spinoff that is now in its third year of existence (they made it through the Year I-II Valley of Death). PureMolecular has two contracts for seafood testing and is expanding into the medical field. Dr. Paul and others published a paper showing that the

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transcription of microbial and phytoplankton biogeochemical genes in the Amazon River Plume reflected the in situ biogeochemical processes, and that the patterns of gene expression were relatively stable over space and time (times up to days and distances up to hundreds of km).

Ernst Peebles

Proposals submitted in 2015 by Dr. Ernst Peebles and his USF colleagues, Dr. Mya Breitbart and Chad Lembke, successfully established USF as one of eight RESTORE Act Centers of Excellence in the State of Florida. A second competition was held during 2016 to combine elements of these existing centers into a new, longer-term plan for fisheries research along Florida's Gulf Coast. For this second round of proposals, Dr. Peebles expanded his research team to include Drs. Stallings and Murawski of USF, Dr. Kevin Boswell of FIU, Dr. David Chagaris of UF, and Dr. Jim Locascio of Mote Marine Lab (Dr. Locascio earned his Ph.D. at USF). The team's idea was to apply DNA barcoding, lifetime chemical records (stored within the eyes and ears of the fish!), and the latest acoustics- and camera-based technologies towards identifying limitations on fisheries production. Their proposed plan was successful, earning them more than \$700,000 for a two-year pilot study, along with the opportunity to renew funding for 15 years thereafter. The team intends to build on this funding to create a larger research effort for Florida's continental-shelf waters, which can extend more than 140 miles offshore.

Brad Rosenheim

Dr. Rosenheim hosted the 5th International Clumped Isotope Workshop at CMS in January. The workshop was attended by 97 scientists from around the world (China, Switzerland, United Kingdom, Australia) and featured St. Petersburg as an excellent conference venue. The workshop banquet took place aboard a ship to add a marine science theme to the meeting. Dr. Rosenheim had three major research initiatives funded in 2016, two by the National Science Foundation and one by NASA via a cooperative agreement with the USDA. These initiatives, two of which are for Antarctic research and one of which is for local carbon cycling research, represent efforts that have stemmed from Dr. Rosenheim's move to USF in 2014. Dr. Rosenheim's research group has grown in 2016, and students have increased their research profiles with papers (Cristina Subt, Ph.D. student, led a publication in the journal *The Holocene* in 2016) and conference presentations (Theresa King, Ph.D. student, won an award for the best presentation for early-career scientists at the Scientific Committee for Antarctic Research in Kuala Lumpur). One student, Devon Firesinger, will defend his MS on a novel use of the radiocarbon clock to model sediment accumulation in early 2017. Dr. Rosenheim published a paper related to the Deepwater Horizon oil spill in *Deep Sea Research II*, underscoring the patchiness of sediment pollution from the well blowout with isotope techniques.

Brad Seibel

Dr. Seibel is a new Professor in the College of Marine Science, having relocated to CMS in January 2016. This year, the Seibel lab conducted 2 month-long field expeditions in the Eastern Tropical Pacific to determine physiological tolerance to changing climate in marine species. As climate change leads to warming, deoxygenation and acidification of ocean waters, the habitat available to marine animals is compressed. The NSF-funded expeditions were designed to predict the extent and severity of future habitat loss and to better understand current distributions of oceanic animals. Expeditions documented the extreme low oxygen that characterizes the Eastern Pacific and the structure of the ecosystems in the open ocean. This work has been published in top journals, including an invited review in *Physiology*, a publication of the *American Physiological Society* that highlights major advances in the field. It was also presented at international conferences and

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workshops. A separate NOAA-funded project similarly tested the changing metabolic scope with increasing temperature in commercially important fishes and squids. The results predict that global warming will limit scope for activity, growth and reproduction in several species representing important fisheries along the Atlantic Coast. The lab made novel discoveries in reproductive biology in squids, CO₂ tolerance in lobsters, and marine biochemistry with implications for fisheries, climate change and human health. Seibel participated in meetings in San Francisco and Paris as an active member of the Global Ocean Oxygen Network (GO₂NE), a working group of the Intergovernmental Oceanographic Commission of the United Nations (UNESCO-IOC).

Amelia Shevenell

Dr. Shevenell studies the evolution of Antarctica's ice sheets on geologic (century to million year) timescales. In 2016, Dr. Shevenell wrote an invited PNAS commentary about the significance of a pair of PNAS papers that underscore the need for additional geologic studies from Antarctica's margins and the integration of these data with computer models to understand ice sheet evolution. Dr. Shevenell and colleagues also held a NSF-funded workshop

(Photo courtesy of IODP)



to assess community priorities for drilling in Antarctica and the Southern Ocean with the International Ocean Discovery Program (IODP). As a result, IODP Expedition 374 to the Ross Sea, which was proposed by Shevenell and colleagues following a 2012 workshop at USF CMS, was scheduled to sail in early 2018, aboard the *JOIDES Resolution* drillship. The two-month expedition will recover sediments that will enable a better understanding of the evolution of the West Antarctic Ice Sheet over the last 20 million years. Reconstructing ice sheet response during past warm climates is critical for modeling and predicting future ice response and global sea level rise. Dr. Shevenell and her student, Ms. Imogen Browne, were selected as two of ten Americans to sail in the 35 member international science party. Shevenell will lead a team of eight sedimentologists. Post-cruise, the two will conduct geochemical analyses to understand the role of ocean temperatures in West Antarctic Ice Sheet evolution. Dr. Shevenell also discussed the importance of her research in an invited Forecastpod.org interview with the *Nature* climate science editor.

Chris Stallings

Dr. Stallings' lab produced six peer-refereed publications on a range of topics including reproduction, population dynamics, and the influence of habitat on fishes, tests of various experimental designs, and quantifying visitation rates of fishermen to different reef types. One paper (Chacin et al. 2016) presented a long-term population analysis of the Pinfish, an incredibly important forage fish in the eastern Gulf of Mexico. The importance of forage fishes to marine food webs has recently gained increased attention among federal and state management agencies, and Chacin et al. (2016) was a focal study at a recent workshop on the topic. Three graduate students (1 Ph.D. and 2 MS) successfully completed their degrees in 2016 and have each moved on to exciting new positions in the field. Dr. Stallings was involved in several large, multi-institutional collaborative research proposals. One of the most exciting proposals will be funded from the Florida RESTORE Act Centers of Excellence Program. The work will involve an expansive set of tools to better understand reproduction dynamics in reef fishes and has the potential to inform stock assessment in near real-time, rather than retrospectively as currently done.

FACULTY HIGHLIGHTS

John Walsh

The response to the online release of the galley proof of a global analysis of air-carried poisons from the sea by Dr. Walsh and co-workers in *Marine Pollution Bulletin*, entitled *More surprises in the global greenhouse: Human health impacts from recent toxic marine aerosol formations, due to centennial alterations of world-wide coastal food webs*, was truly outstanding. The editor of the Journal described it as a *tour de force*, while various readers invited Dr. Walsh to present these results at an international conference on pharmacology, and other editorial boards have requested additional review articles on the implications for oncological, veterinary, agricultural, infectious disease, and food technology sciences. A follow-on book was approved for publication by Elsevier, Oxford in December 2017, with the title *Wind-borne illness from coastal seas: Present and future consequences of toxic marine aerosols*.

Robert Weisberg

The West Florida Continental Shelf (WFS) is often described as being oligotrophic (nutrient deplete). Yet it supports major recreational and commercial fisheries and experiences copious algae blooms. The explanation is simple. On an inter-annual basis, the ocean circulation replenishes the WFS with nutrients of deeper ocean origin. This accounts for the inter-annual variability observed in algae blooms and their composition (e.g., red tides in some years and not in others) and species specific fisheries recruitment successes. Using a combination of ocean circulation observations and simulation models Dr. Weisberg's group studies the role of the circulation in determining WFS water properties and how the circulation impacts ecology. For instance, Dr. Weisberg and co-authors published a paper in the *Journal of Geophysical Research-Oceans* that determined the origin and pathways of new water bathing the WFS under the protracted upwelling conditions of 2010. The origin was the upper continental slope, where continual replenishment of water by the Gulf of Mexico Loop Current results in elevated nutrients. The pathways from the shelf slope to the near shore showed why there are certain spatial orderings to WFS ecology such as why red tides and gag juveniles tend to aggregate between Tampa Bay and Charlotte Harbor and also at and to the west of Apalachicola Bay. From such work it was concluded that complex biological processes, with many degrees of freedom, may be successful if the physics of the coastal ocean circulation provide environmental conditions that are conducive to success, and conversely.

Facilities

Two major projects were completed in 2016. The first was the replacement of the four air handling units that service all the wet laboratories in the Knight Oceanographic Research Center (KRC), and the second was the reconfiguration of the supply water for the condensers that service the three KRC environmental rooms. A third project that was initiated in 2015 is still pending while we seek funding. This project involves the remodel of ~3300 sq. ft. of lab space on the 2nd floor of MSL as well as improvements to building-wide and long-deficient life, safety and HVAC components. A 2016 legislative request for funding has been submitted.

Engineering and design work was completed for a project involving major renovations to labs in KRC and MSL in preparation for the construction of a new clean lab in KRC and the purchase of two high-resolution mass spectrometers. Work on this project is slated to begin early 2017.

Numerous minor projects were also completed throughout the year including replacement of the coil section in KRC air handler #5, repairs to pipe insulation in MSL and KRC, replacement of a roll-up door on KRC, installation of a new MSL exterior door, and replacement of a compressed air line in MSL. Emergency repairs also had to be undertaken on the KRC fire panel and automatic transfer switch that were damaged by a lightning strike.

GRADUATE EDUCATION AND AWARDS

Graduate Education and Awards

ACADEMIC AFFAIRS

The new format for the PhD Comprehensive Exams implemented in the Fall Semester of 2015 is continually being improved. The new format consists of an early Integrated Marine Science Exam (IMSE) and then later, a PhD Candidacy Exam (PCE). The IMSE is given after PhD students have completed their four core courses: Biological Oceanography, Chemical Oceanography, Geological Oceanography, and Physical Oceanography, usually at the beginning of their second or third year. Eight professors, one from each discipline, provide and grade a written exam that tests the student's ability to integrate concepts from the four core courses. The exam is given in early September and an oral follow-up exam is given within one month for students whose written answers were marginal. Workshops for the new students are being provided to assist them in preparation.

Drs. Teresa Greely, Monica Cook, Kevan Main, Mark Luther, Al Hine, and John Paul, five online courses were taught to over 300 undergraduate students, which effectively tripled the number of undergraduates historically taking courses in the College of Marine Science. The five courses: *Marine Aquaculture*, *Marine Microbiology*, *Geological History of Florida*, *Port Sustainability*, and *Introduction to Oceanography*.

Twenty-two graduate students entered the Marine Science Program in Fall 2016 with a total GRE mean of 316 (up by 8 points). These students attended Orientation Week, including taking the required two-day NSF Presentation Boot Camp with faculty, which has led to an improvement in the quality of presentations made by our students and faculty. Many students from this year and previous years were very active in educational outreach activities such as the NSF Spoonbill High School Competition, the Oceanography Camp for Girls, the St. Petersburg Science Festival, and the Graduate Student Symposium. These training activities and the students' strong efforts have paid off as documented by the numerous honors, awards, presentations, and publications listed in this annual report. Nine students graduated with their PhD, including four underrepresented minorities (44% of the total).



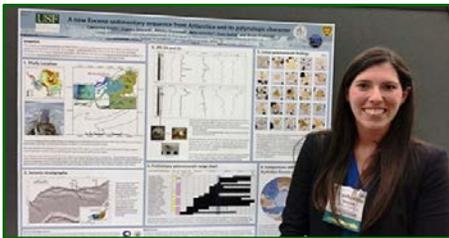
2016 CMS New Students

The CMS graduate program was given recognition as a model for Graduate Student Success by an article written by Brittany Sheehy and published in NACADA's e-publication, *Academic Advising Today*, entitled, "The Global Community for Academic Advising."

A copy of it can be found at: <http://www.nacada.ksu.edu/Resources/Academic-Advising-Today/View-Articles/Graduate-Student-Success-A-Model-that-Works.aspx>. This publication highlights how CMS is at the forefront of preparing our students for a variety of career options.

GRADUATE EDUCATION AND AWARDS

In 2016, our graduate students published 26 journal articles, including 15 publications with graduate students as first author and 11 as co-authors. Graduate student proposals resulted in over \$230,000 in awarded external funding. Our students earned over 50 awards including prestigious fellowships and best presentations at professional meetings.



Catherine Smith was awarded the “Best Student Poster” award at the Geological Society of America-AASP-TSP joint Annual Meeting

DIVERSITY

CMS works hard to increase minority participation in marine science. The percentage of under-represented minority students in our program over the past 13 years has grown to ~15%, which is nearly double the ~8% national average in Oceanography. We have been able to make significant advances in this issue due to the initial funding support by NSF Bridge to the Doctorate awards to USF’s College of Engineering and Marine Science and by the Alfred P. Sloan Foundation. Faculty and administration leaders at CMS over the years, including Ashanti Johnson, Peter Betzer, Frank Muller-Karger, and David Naar, as well as José L. Zayas-Castro and Bernard Batson from the College of Engineering have led these efforts. Funding from the Sloan Foundation (provided to USF as an Alfred P. Sloan Foundation University Center of Exemplary Mentoring (UCEM)), the NSF Bridge-to-the-Doctorate, and private funding from the USF Foundation (managed by PIs: Dr. Frank Muller-Karger, Mr. Bernard Batson, and others at the College of Engineering) have been instrumental in attracting and training underrepresented minority students who have demonstrated excellence as undergraduates, usually due to support from the NSF LSAMP program.

Most recently, USF was designated as a University Center of Exemplary Mentoring (UCEM) by the Alfred P. Sloan Foundation following a proposal and site visit in 2016. The following excerpt is from a recent draft of a USF press release:

The University of South Florida is celebrating a significant achievement with renewal of its University Center of Exemplary Mentoring (UCEM) grant to the College of Engineering and the College of Marine Science by the Alfred P. Sloan Foundation. Managed by the National Action Council for Minorities in Engineering (NACME), the award provides an additional \$630,000 over the next three years for a total of nearly \$4 million from the Sloan Foundation to USF in support of minority doctoral education since 2005. USF is the only university in Florida to receive this distinction, and the only non-AAU institution, joining Cornell University, Georgia Institute of Technology, Pennsylvania State University, MIT, UC-San Diego, University of Illinois at Urbana-Champaign, and the University of Iowa.

The UCEM grant will continue under the direction of Jose Zayas-Castro, Professor and Executive Associate Dean in the College of Engineering, Frank Muller-Karger, Professor of Biological Oceanography in the College of Marine Science, and be managed by Bernard

GRADUATE EDUCATION AND AWARDS

Batson, director of diversity programs at the College of Engineering. An expanded Faculty Coordinating Committee from both Colleges will guide the programmatic activities. Additional leadership and advocacy will be provided by Dean Robert Bishop of the College of Engineering, Dean Jacqueline Dixon of the College of Marine Science, and the USF Office of Graduate Studies (OGS).

One of the important themes stressed at the Annual Compact for Faculty Diversity is that underrepresented minority graduate students benefit from exposure and interaction with others like them who have succeeded in academia. To this end, the Colleges of Marine Science and Engineering continue to invite speakers to inspire our graduate students and our faculty. In 2016, Dr. Samuel George Philander, a faculty role model for diversity, received an honorary doctorate from the College of Marine Science during the Spring Commencement. He holds the Knox Taylor Professor of Geosciences at Princeton University and is a distinguished researcher of climate change and has improved conditions in academia for minorities in South Africa as well as the USA. He was nominated and hosted by Dr. Robert Weisberg. Our next goal is to improve diversity within the CMS faculty.



Annual National Sloan Meeting at the Compact for Faculty Diversity held at the Tampa Marriott Waterside Hotel

Three CMS 2016 Ph.D. graduates who were advised by Dr. Pamela Hallock Muller from left to right: Dr. Natasha Mendez-Ferrer, Dr. Michael Martinez-Colon, Dr. Maria Vega-Rodriguez

DEGREES OFFERED

The following degrees are offered at the College of Marine Science. For more information please [visit our website](#).

Graduate Certificate

Teaching & Communication Ocean Sciences Broader Impacts

Master's of Science (M.S.)

Biological, Chemical, Geological, Marine Resource Assessment (MRA), and Physical Oceanography Concentrations

Doctoral (Ph.D.)

Biological, Chemical, Geological, Marine Resource Assessment (MRA), and Physical Oceanography Concentrations

STUDENTS GRADUATING IN 2016

Masters (9)

Lawler, Stephanie advised by Mya Breitbart, spring, "Characterization of Bacterial Diversity in Cold-Water Anthothelidae Corals"

GRADUATE EDUCATION AND AWARDS

Reinert, Amanda advised by Robert Weisberg, spring, "West Florida Shelf Connectivity: An Exploratory Study"

Beckwith, Sean advised by Pamela Hallock Muller, fall, "Abundance of *Archaias angulatus* on the West Florida Coast Indicates the Influence of Carbonate Alkalinity over Salinity"

Curtis, Joseph advised by Christopher Stallings, fall, "Resource Use Overlap in a Native Grouper and Invasive Lionfish"

Kurth, Benjamin advised by Christopher Stallings, fall, "Trophic ecology and habitat use of Atlantic Tarpon (*Megalops atlanticus*)"

Long, Jacqueline advised by Chuanmin Hu, fall, "Whiting events off southwest Florida: remote sensing and field observations"

Michaud, Brianna advised by Ernst Peebles, fall, "A Habitat Analysis of Estuarine Fishes and Invertebrates, with Observations on the Effects of Habitat-Factor Resolution"

O'Loughlin, Benjamin advised by Robert Weisberg, fall, "Evaluation of Search and Rescue Planning Tools on the West Florida Shelf"

Smith, Catherine advised by Pamela Hallock Muller, fall, "An Early Paleogene Palynological Assemblage from the Sabrina Coast, East Antarctica: New Species and Implications for Depositional History"

Ph.D. (9)

Tzadik, Orián advised by Christopher Stallings, spring, "Field Observations and Novel Methodologies for Carbon System Assessments in Coastal Waters"

Wirt, Katherine advised by Pamela Hallock Muller, spring, "Acropora Habitat Evaluation and Restoration Site Selection Using a Species Distribution Modeling Approach"

Barnes, Kwasi advised by Pamela Hallock Muller, summer, "Diversity and Distribution of Diatom Endosymbionts in *Amphistegina* spp. (Foraminifera) Based on Molecular and Morphological Techniques"

Ferrer-Mendez, Natasha advised by Pamela Hallock Muller, summer, "Photic Stress in Symbiont-Bearing Reef Organisms: Analyses of Photosynthetic Performance"

Martinez-Colon, Michael advised by Pamela Hallock Muller, summer, "Pollutants and Foraminiferal Assemblages in Torrecillas Lagoon: An Environmental Micropaleontology Approach"

Dunn, Shane advised by Al Hine, fall, "Miocene Contourite Deposition (along-slope) near Desoto Canyon, Gulf of Mexico: The Product of an Enhanced Loop Current"

Masi, Michelle advised by Cameron Ainsworth, fall, "An Ecosystem-Based Approach to Reef Fish Management in the Gulf of Mexico"

Symonds, Erin advised by Mya Breitbart, fall, "Pepper Mild Mottle Virus as a Surrogate for Enteric Viruses: Implications for Assessing Water Quality"

Vega-Martinez, Maria advised by Frank Muller-Karger, fall, "Influence of water quality on stony coral diversity and net community productivity in the Florida Keys"

GRADUATE EDUCATION AND AWARDS

STUDENT AND POST-DOC AWARDS AND ACHIEVEMENTS

Student Awards



Kara Vadman – NSF Graduate Research Fellowship & the Loeblich and Tappan Student Research Award



Jonathan Sharp – NSF Graduate Research Fellowship



Natasha Mendez-Ferrer – Dissertation Completion Fellowship



Amanda Sosnowski – NSF Graduate Research Fellowship Honorable Mention & Ocean Film Festival Honorable Mention



Ileana Freytes Ortiz – USGS Northwest Climate Science Center, McCall Outdoor Science School Fellowship in Science Communication



Theresa King – Genshaft Family Doctoral Fellowship & “Best Presentation Award” for Early Career Scientists



Elizabeth Brown – 2016 Johanna M. Resig Foraminiferal Research Fellowship



Erin Symonds – Raymond W. Sarver Award from the American Society for Microbiology



Shaojie Sun – Received NASA NESSF Fellowship



Matthew Birk – 2015 Watkins Award for Excellence in Research



Justin Saarinen – Gulf of Mexico Coastal Ocean Observing System Fellowship (GCOOS)



Imogen Browne – Cushman Travel Fund

GRADUATE EDUCATION AND AWARDS



Maria Vega – Rodriguez – Research and Laboratory Group featured in *Diversity Magazine*



Dinorah Chacin –NSF GROW Award & Roche/ARCS Scholarship



Christian Gfatter – Inducted into the Phi Kappa Phi Honor Society

Education Outreach

Teresa Greely and Angela Lodge led the college's education and outreach (E&O) activities. The accomplishments in E&O reflect a diversity of programs and events that have advanced ocean literacy and research amongst K-12 teachers and their students, undergraduate and graduate students.

With NOAA B-WET funding, E&O continued to lead Florida teachers through an experiential field course to monitor and understand Tampa Bay's coastal environments. Teachers learned collected hydrologic, atmospheric, and soil measurements following scientific protocols and shared internationally.

Other education programs included:

- GLOBE teacher professional development for teachers who then trained their K-12 students to be citizen environmental scientists;
- Marine sciences courses for the USF Honors College and USFSP College of Education;
- NOAA Ocean Exploration's teacher professional development series. Florida teachers learned *How and Why We Explore the Oceans* and followed the expeditions of the *Okeanos Explorer*;
- Hosted school groups for Ocean Day visits, lab tours and career explorations.
- Led coastal field trips throughout Tampa Bay and the Gulf for USF Tampa Precollege Programs;
- Hosted visits from local schools and USFSP College of Education Precollege STEM programs.



NOAA Gulf BWET – TB Teacher Program exploring the watershed from the Bay to the Gulf.

- The Spoonbill Ocean Sciences Bowl. E&O team hosted the 13th annual academic brain bowl with over 160 participants, including 110 high school students and teachers from across West Florida. Volunteers, both returning and new, represented the FWCC, Eckerd College, USGS, Clearwater Aquarium, FMSEA, FL Sea Grant, Florida Aquarium, Ocean Optics, USFSP, and USF Marine Science. Congratulations to Eastside High School from Gainesville, Florida who advanced to the NOSB Finals competition.



EDUCATION OUTREACH



Eastside High School from Gainesville, Florida



Oceanography Camp for Girls Team

- The Oceanography Camp for Girls. Our pre-college STEM program completed 25 years of encouraging teenagers to consider careers in the sciences while developing a positive sense of self, science, and the environment. Over 1000 teen girls have completed the 3-week program, with 32 girls participating this past summer. Graduate and undergraduate students served as science mentors along professional staff, and participating scientists from FWCC, USGS and USF Marine Science.



Research Cruise Measuring Fishes



Caladesi Island Coastal Geology – Substructure

- Participation in research expeditions in the Gulf. Some 20 students gained invaluable field experience and posted daily blogs to engage other students in the research happening at sea. Visit blogs from Sea during the IXTOC revisited expedition, <http://www.marine.usf.edu/c-image/our-blog>. Through C-IMAGE Outreach and Open Mind Media, two additional podcasts were completed providing Gulf research to public radio listeners. Listen to all CIMAGE blogs, <http://www.marine.usf.edu/c-image/education-and-outreach/download-our-podcasts>.



- The College continued coordination and participation in the annual St. Petersburg Science Festival. This is a College-wide outreach effort, which brought over 25,000 visitors to campus to experience the research and E&O programs taking place in the marine sciences. <http://www.stpetescifest.org/>.

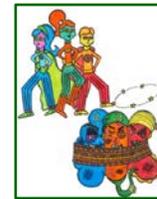


- The E&O team were invited to present ocean literacy research and the OCG program with an international audience of educators at the European Marine Science Educators Association conference. Several international collaborations were fostered.

EDUCATION OUTREACH

OTHER OUTREACH ACTIVITIES

In addition, many faculty and students engaged with the community in creative ways. The Breitbart lab created an activity for the Saint Petersburg Science Festival to teach the public about phage (viruses that infect bacteria), with an emphasis that not all viruses are bad – some can actually be heroes – used to protect against bacterial infections! Local school groups learned about the specificity of phage infection by using specific phage superheroes to selectively bind to and remove bacterial pathogens without harming the good bacteria. Artists Kema Malki and Natalie Sawaya created temporary tattoos and comic strips (respectively) to engage the public in our research!



The Breitbart lab also ran several activities for the STEAM Girl Program at East Lake Middle - Academy of Engineering, where girls learned about the small things in the oceans, ranging from bacteria to phytoplankton and zooplankton through a combination of bacterial culturing, microscopy, and building plankton to test their ability to float.



EDUCATION OUTREACH

The Center for Integrated Modeling and Analysis of Gulf Ecosystems (C-IMAGE Consortium) is an international research group studying the lasting impacts of the Deepwater Horizon and Ixtoc I spills - the two largest spills in Gulf history. C-IMAGE shares findings with international partners to provide a better understanding of the processes and impacts of oil spills. The goal of our outreach program is to provide a humanizing aspect to our science through audio podcasts, public events, and interactive websites.

Audio Products:



The Loop Podcast - Produced by independent journalist David Levin, *The Loop* provides 10-minute episodes about varying aspects of C-IMAGE research. Interviews with USF-Marine Science faculty and students gives expert opinions about spill impacts on fishes and the sea floor, ecosystem modeling, and satellite oceanography.

As of March 2017, *The Loop* has 10 episodes with two more produced through 2018.

Story Collider – The Story Collider believes everyone has a story about science—a story about how science made a difference, affected them, or changed them on a personal and emotional level. We find those stories and share them in live shows and on our podcast.



In conjunction with the Gulf of Mexico Oil Spill and Ecosystem Sciences Conference, C-IMAGE hosted a Story Collider in Tampa, FL featuring the personal perspectives of five people tied to the spill. In 2016, four College of Marine Science researchers – Murawski, Daly, Peebles, Romero – and Tampa Bay Times Perspectives Editor Verhulst shared their stories of science, each focused around the 2010 *Deepwater Horizon* oil spill.



Public Events:

Communicating Science Weekend – Fifteen young scientists, including six from the College, participated in a professional development workshop focused on science communication. Attendees practiced 2-minute speeches explaining their research, worked on real-world problem solving topics, and presented outreach projects designed for target audiences.

EDUCATION OUTREACH



Dispatches from the Gulf Premiere – Collaborating with the Florida Institute of Oceanography and Gulf of Mexico Research Initiative, the Premiere of the oil spill documentary, Dispatches from the Gulf, was held at the Mahaffey Theater. A poster session, expert panel, and information booths were on display for an estimated 1,000 attendees.

Pint of Science – C-IMAGE researchers have been invited to share their science at the annual Pint of Science- Tampa Bay. Held at local breweries, scientists share their studies without the use of slides to engage the audience.

Beneath the Horizon:

In addition to environmental impacts, personal and economical impacts remain across the Gulf. C-IMAGE releases Beneath the Horizon, an interactive oil spill timeline examining the consequences of the two major oil spills in the Gulf of Mexico: The 2010 Deepwater Horizon oil spill in the northern Gulf and the lesser-known 1979 Ixtoc oil spill in the southern Gulf.

Oil Spill	Amount spilled:	Duration	Area	Shoreline impacted:
DEEPWATER HORIZON	4.9 MILLION BARRELS	April 20 – July 15, 2010	2,500 to 68,000 m2	1,313 miles
IXTOC	3 MILLION BARRELS	June 1979 – March, 1980	1,100 m2	162 miles

Beneath the Horizon features scientists who have devoted their lives to studying the spills and residents who lived through them, and explores how the environment and people cope with disaster and what we can expect for recovery in the future. To learn more, please visit www.beneaththehorizon.org.

Development

FELLOWSHIPS

On October 24, 2016, CMS recognized fellowship and award recipients and their generous supporters at the Fifth Annual College of Marine Science Fellowships and Awards Luncheon held at the Johns Hopkins All Children's Hospital Education and Conference Center. Through the leadership of Dean Jacqueline Dixon and former Deans Peter Betzer and William Hogarth, our \$18M endowment provides ~\$376K/yr for endowed fellowships to 30 CMS graduate students. The luncheon provides an opportunity for fellowship and award recipients to meet the individuals and families who have helped to make it possible for these students to pursue a degree at the College of Marine Science.



2016-2017 Endowed Fellowship Recipients

The 2016-2017 Endowed Fellowships were provided to the following students:

Joshua L. Breithaupt - St. Petersburg Downtown Partnership Fellowship in Coastal Science

Elizabeth Brown - Oceanography Camp for Girls Fellowship

Gabriel Browning - Anne & Werner Von Rosenstiel Fellowship

Katherine Bruder - Anne & Werner Von Rosenstiel Fellowship

Shuangling Chen - Tampa Bay Parrot Head Fellowship in Marine Science

Alexandria Creasy - Southern Kingfish Association's Fellowship

Erin Cuyler - Gulf Oceanographic Charitable Trust Endowed Fellowship in Marine Science

Kristina Deak - William and Elsie Knight Endowed Fellowship for Marine Science

Lindsey Dornberger - Garrels Memorial Fellowship in Marine Science

Christian H. Gfatter - Linton Tibbetts Fellowship

Shaniqua Gladney - Bridge to the Doctorate Fellowship

Elizabeth Herdter - George Lorton Fellowship in Marine Science

Alexander Ilich - C. W. Bill Young Fellowship

Matthew J. McCarthy - Gulf Oceanographic Charitable Trust Endowed Fellowship in Marine Science

DEVELOPMENT

Travis Mellett - The Jack and Katharine Ann Lake Fellowship in Marine Science

Dana M. Nieuwkerk - The Wells Fargo Fellowship in Marine Science

Jonathan Peake - Anne & Werner Von Rosenstiel Fellowship

Natalie Amber Sawaya - Sanibel-Captiva Shell Club / Mary & Al Bridell Memorial Fellowship

Jonathan Sharp - William and Elsie Knight Endowed Fellowship for Marine Science

Catherine D. Smith - Carl Riggs Fellowship in Marine Science

Susan Snyder - William and Elsie Knight Endowed Fellowship for Marine Science

Shaojie Sun - The Jack and Katharine Ann Lake Fellowship in Marine Science

Kara Vadman - Southern Kingfish Association's Fellowship

Ryan A. Venturelli - Paul Getting Endowed Memorial Fellowship

Kara Wall - William Hogarth Marine Mammal Fellowship

Yingjun Zhang - Anne & Werner Von Rosenstiel Fellowship

Also recognized were achievements of students, alumnae, and researchers through the Bernstein Outstanding Authorship Award, the Sackett Prize for Innovative Research, and the Costello Interdisciplinary Award. The 2016-2017 Award Recipients were:

The 2016-2017 Award Recipients:

David English – David K. Costello Interdisciplinary Engineering Award

Elizabeth Fahsbender– Renate E. Bernstein Outstanding Authorship Award

Esa-Matti Tastula – Sackett Prize for Innovative Research

FUNDRAISING



(From left to right) Dean Dixon, Howard Rutherford, Carol Rogers, Scott Rogers

Rogers '77, CMS will be able to award the Thomas E. Pyle Memorial Fellowship in Marine Science. Beginning in 2017, this fellowship will be awarded annually to a graduate student in marine science pursuing a career in

In addition to fellowship support, alumni, faculty, staff and friends donated \$356,639 support for current and new endowment funds as well as for current operations. This year, USF St. Petersburg and USF College of Marine Science co-founded the Open Partnership Education Network (OPEN) through a generous gift from the Aresty Family Foundation. This initiative is predicated on a simple but powerful tenet: that by communicating in an open space, all ideas – big or small- can transform into unique learning opportunities. It is our goal that OPEN will make St. Petersburg a smarter, more connected city, with marine research, technology and innovation in the forefront. In addition, thanks to the generosity of Carol and Scott

DEVELOPMENT

geology or geophysics. As a result, CMS will continue to attract and retain the best and the brightest graduate students.

While the college currently has many of the basic components in place for achieving preeminence among oceanographic institutions, it seeks to create the critical mass of intellectual capital necessary to ensure advancement to the next level of national and international prominence.

Specifically, support is needed in the following areas:

Dean's Innovation Endowment for Research Support: To recruit and retain top caliber faculty, significant resources needed for acquisition and maintenance of state-of-the-art instrumentation, for seed funds for research and commercialization of new technologies, and for competitive start-up and retention packages.

Graduate Excellence: The College of Marine Science strives to attract and retain the highest quality graduate students, while also ensuring that its educational programs are available to all qualified students without regard to financial circumstances.

Postdoctoral Fellowship Program: Postdoctoral research fellow programs are a long-standing tradition at the nation's best research universities and oceanographic institutions. Implementation of a successful postdoctoral research program is pivotal to the success of the college.

Endowed Chairs and Professorships: To further enhance its ability to undertake fundamental research, CMS seeks to attract and retain key faculty operating on the frontiers of their respective fields.

Retirees

Peter Betzer, Professor, Department Chairman & Founding Dean

USF College of Marine Science

1971 to 2007

10 years ago, at an event similar to this one, Peter Betzer was recognized for his tremendous contributions to the university and community. I want to acknowledge him again before we honor those who retired over the last decade.



Professor Paula Coble Rhodes

USF College of Marine Science

1992 to 2014

In December of 2014, Dr. Paula Coble retired from the CMS faculty. Paula pioneered work on the fluorescence properties of dissolved organics in seawater. At CMS she expanded her research to include carbon cycling, fluorescence of dissolved organics in seawater, laser fluorescence sensor development, marine organic geochemistry, ocean color, chemistry and biology of subsurface particle layers in low oxygen waters, biogeochemistry of the ocean, and marine denitrification. Paula's contributions were made more remarkable by her dedication to and involvement in marine education and outreach. She was the founder and executive producer of Project Oceanography and the founding director of COSEE Florida (Center for Ocean Sciences Education Excellence). Over eight years, Project Oceanography created some eighty television shows targeting middle school science students across the United States and internationally. Paula and her husband, Sandy Rhodes, are currently enjoying life in the San Francisco Bay area in California, where she spends time with her one-year-old granddaughter and riding her Hanoverian mare.

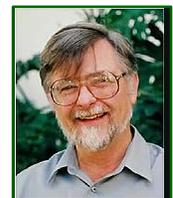


Professor Kent A. Fanning

USF College of Marine Science

1973 to 2013

Kent Fanning arrived in 1973 and was the ninth faculty member. His research focused on nutrients (nitrate, phosphate, ammonium) and radionuclides in the ocean's water column and sediment pore waters. His work took him from Colombia to the Cariaco basin off Venezuela to the west Florida shelf and Tampa bay. His student Rob Masserini was CMS' 100th graduate. For many years, Kent together with Norm Blake coordinated an Introduction to Oceanography course to a large number of undergraduates that exposed them to the exciting research in our Department and College. Kent was Editor of the Journal of Geophysical Research Oceans, and served as Assistant Chair for 6 years and Associate Dean for 8 years. He worked with Peter Betzer to attract the USGS Coastal Research Division to St. Petersburg, to attract funding for the KRC building and for the joint CMS/USFSP Science & Technology building on the USFSP campus.



RETIREES

Professor Luis Garcia-Rubio

USF College of Marine Science

2002 to 2011



Professor Luis Garcia-Rubio has retired in 2011 after a long and productive career at USF. He began his employment at USF in 1984 as an assistant professor in the Chemical Engineering and Chemistry Departments and served as Chairperson from 1997 to 2000. In 2002, he transferred to the College of Marine Science. As a physical chemist, Dr. Garcia-Rubio is an expert in polymer research, including sensor development and light scattering and spectral de-convolution techniques. He published over 100 papers and received nine patents and patent applications, as well as five invention disclosures. He was inducted into the University of South Florida Academy of Inventors in 2009. In 2004, Dr. Garcia-Rubio founded Claro Scientific LLC. The main goal of Claro is to develop new spectroscopic sensor systems capable of addressing increasingly complex information needs for a variety of applications, including medicine, bio-tech, and environmental monitoring.

Professor Albert C. Hine

USF College of Marine Science

1979 to 2017



Al Hine has had a distinguished career as a sedimentary geologist. He published over 140 scientific papers and produced over 30 MS and PhD students. His success as a mentor is on display tonight by the fact that two of our Eminent Scholars, Lee Kump and David Mearns, were his students. His research focused on using geophysical remote-sensing tools, such as seismic reflection profiling, swath bathymetry and side-scan sonar, and direct sampling techniques, such as drilling into the geologic strata, to provide basic understanding of the geology and tectonics of continental margins and carbonate platforms. His research had important societal applications such as the discovery of huge offshore, economically viable phosphate deposits (estimated \$1 billion worth beneath the NC continental shelf), identification of geologic hazards such as massive submarine landslides potentially dangerous to offshore oil rigs and buried pipelines, and the discovery of environmentally sensitive areas such as the deep coral reefs off Florida. Al was awarded the Society of Sedimentary Geology's Francis P. Shepard Medal in 2009 for sustained excellence. He served as Associate Dean at CMS from 2003-2011 and as my ambassador for alumni relations for the last 6 years. Al is the author of a book entitled, "***Geologic History of Florida—Major Events that Formed the Sunshine State***" and a senior-authored a 2nd book with four other CMS faculty and alumni entitled, "***Sea Level Rise in Florida—Science, Impacts, and Options***".

RETIREES

Dr. William T. Hogarth

USF College of Marine Science

2008 to 2010



Bill Hogarth has had a singularly diverse and enormously influential career. Bill's first career was in fisheries management at a variety of North Carolina and NOAA agencies. In 2001, he was appointed as Assistant NOAA Administrator for Fisheries (Director of the National Marine Fisheries Service), during which time he helped to implement the 2007 reauthorization of the Magnuson Stevens Act, to reduce high seas whaling, and to enact major reductions in quota excesses for bluefin tuna on both sides of the Atlantic.

After such a distinguished career, most folks would go quietly into the sunset. Not Bill. In 2008, he came to USF to start a second career as Interim Dean of the College of Marine Science. His many achievements include acquisition of the *R/V Weatherbird II* for use by the Florida Institute of Oceanography, modernization of the MSL laboratories through a \$2 M NSF grant, and strengthening support programs and scholarships for graduate students. His most notable accomplishment as dean was, however, directing the academic response by Florida scientists to the *Deepwater Horizon* oil spill. Working with federal agencies, Dr. Hogarth helped mobilize a significant at-sea response aboard the *R/V Weatherbird II*, undertaking dozens of cruises to the affected area. The results of this research have been well documented in scores of published papers and data sets. Then Florida Governor Charlie Crist appointed Bill to the Gulf of Mexico Research Initiative (GoMRI) Board of Directors. This board has overseen the allocation of \$500 million in research funding Gulf-wide to address impacts of the spill. The College of Marine Science has been able to compete successfully for over \$40 M in GoMRI funding.

Following his tenure as interim Dean, Bill started his third career as director of the Florida Institute of Oceanography (FIO), where he established the Florida Centers of Excellence program funded by the settlement of the BP *Deepwater Horizon* lawsuit and secured funding for a new research vessel to replace the *R/V Bellows*. Built in Tarpon Springs, the vessel will be christened in May and launched as the aptly named *R/V W. T. Hogarth*.

His fourth career involved a brief stint as Interim Chancellor of USFSP. We're waiting to hear what his fifth career will be.

While his USF career spanned only 10 years, his impact on the College of Marine Science, the St. Petersburg USF campus and the Florida Institute of Oceanography will be felt for decades to come. We are grateful for his leadership.

Professor Joseph J. Torres

USF College of Marine Science

1980 to 2013



Jose has authored 96 articles with an emphasis on the biology of life in the open sea specializing in animal physiology, ecology, and biochemistry. His work embraced a very broad array of animal taxa ranging in size from small crustaceans to fishes and he pursued his interests all over the world, including the Antarctic, the Arctic, the Atlantic, the Pacific, and the Gulf of Mexico. His main interests are in how open-ocean species acquire and use

RETIREES

energy and how they have adapted to the temperatures, pressures and oxygen levels that typify their habitat. He received multiple awards, including the President's Award for Faculty Excellence and Fellow of the American Association for the Advancement of Science. As a guest editor for the prestigious publication Deep-Sea Research, he and three colleagues produced three volumes (2004, 2008, and 2011) describing the Southern Ocean GLOBEC program and its contributions to science. He is currently writing a book for Wiley-Blackwell describing the life and times of pelagic species. It is entitled "Life in the Open Ocean" and one of the major reasons for his retirement was to give him the time to complete it. He is still plotting ways to return to the Antarctic.

Professor Edward S. Van Vleet

USF College of Marine Science

1979 to 2012



Dr. Van Vleet served as a faculty member in the Department/ College of Marine Science for close to 33 years. As an organic chemist, Ted's research specialized in molecular organic compounds in the environment, both natural and man-made. He published over 60 papers on oil spills, air-sea interface chemistry, microbial ecology, Antarctic biology, input and accumulation of anthropogenic contaminants, endocrine disrupting compounds and toxicology. Ted's research in the canals and lagoon of Venice, Italy was common thread in his work for over 25 years. During 30 of his 33 years in the College/Department of Marine Science, Ted served with enthusiasm and dedication as the Director of Academic Programs and Student Affairs. The success of our graduate program is largely tied to his competent and caring leadership.

Appendices

Appendix A

Publications

Appendix B

Active Research Awards

APPENDIX A. PUBLICATIONS

Appendix A. Publications

Bold indicates Faculty and Research Staff/Faculty; Underline indicates CMS graduate student or post-doc

CMS BOOKS

- Ainsworth, C.H.** 2016. British Columbia Marine Fisheries Catch Reconstruction 1873-2011. In Pauly, D. and Zeller, D. (eds.). *Global Atlas of Marine Fisheries*. Island Press. 550 pp.
- Chambers D.P.**, and **G.T. Mitchum** (2016) Observing modern-day sea level rise and predicting the future, In: **A. Hine, D. P. Chambers**, T. D. Clayton, M. R. Hafen, and **G. T. Mitchum** (editors) *Sea Level Rise in Florida: Science, Impacts, and Options*, 1st edition, University Press of Florida, ISBN 978-0-8130-6289-1.
- Simenstad, C., J. Van Sickle, N. Monsen, **E.B. Peebles**, G.T. Ruggione, and H. Gosnell (2016) Independent review panel report for the 2016 California WaterFix aquatic science peer review. Technical report submitted to the Delta Science Program, Sacramento, CA.
- Testa, J. M., **Y. Li**, Y. J. Lee, M. Li, D. C. Brady, D. M. Di Toro, and W. M. Kemp, (2016), Chapter 6: Modeling physical and biogeochemical controls on dissolved oxygen in Chesapeake Bay: Lessons learned from simple and complex approaches, in *Modeling Coastal Hypoxia - Numerical Simulations of Patterns, Controls and Effects of Dissolved Oxygen Dynamics*, edited by D. Justic, K. Rose, R. Hetland, and K. Fennel. Springer International Publishing AG, Switzerland.

CMS JOURNAL PUBLICATIONS (140)

- Adhikari, P.L.; K. Maiti; E.B. Overton; **B.E. Rosenheim**; B.D. Marx (2016). "Distributions and accumulation rates of polycyclic aromatic hydrocarbons in the northern Gulf of Mexico sediments." *Environmental Pollution*. v. 212, pp. 413-423, doi:10.1016/j.envpol.2016.01.064.
- Aguilar-Islas, A.M., M.J.M. Seguret, R. Rember, **K.N. Buck**, P. Proctor, C.W. Mordy, and N.B. Kachel (2016). Temporal variability of reactive iron over the Gulf of Alaska shelf. *Deep-Sea Research II*, 132: 90-106.
- Ainsworth, C.H.** 2016. British Columbia Marine Fisheries Catch Reconstruction: 1873 to 2011. *BC Studies*, 188: 81-90.
- Astor, Y., L. Guzmán, L. Troccoli, **L. Lorenzoni**, **F. Muller-Karger**. 2016 (In press). Síntesis de las tendencias de los parámetros oceanográficos y ópticos en la estación serie de tiempo CARIACO (enero 1996–diciembre 2013). *Memoria de la Fundación La Salle de Ciencias Naturales* 74 (181-182).
- Atkinson, A., S.L. Hill, E.A. Pakhomov, V. Siegel, R. Anadon, S. Chiba, **K.L. Daly**, R. Downie, P. Fretwell, L. Gerrish, G.W. Hosie, M.J. Jessopp, So Kawaguchi, B.A. Krafft, V. Loeb, J. Nishikawa, H.J. Peat, C.S. Reiss, R.M. Ross, L.B. Quetin, K. Schmidt, D.K. Steinberg, R.C. Subramaniam, G.A. Tarling, and P. Ward (2016) KRILLBASE: a multinational, circumpolar database of abundance of Antarctic krill and salps. *Earth System Science Data*, doi:10.5194/essd-2016-52.
- Barnes, B. B.**, **C. Hu** (2016) Island building in the South China Sea: detection of turbidity plumes and artificial islands using Landsat and MODIS data. *Sci. Rep.* 6, 33194; doi: 10.1038/srep33194.
- Barnes, B. B.**, **C. Hu** (2016) Dependence of satellite ocean color data products on viewing angles: A comparison between SeaWiFS, MODIS, and VIIRS. *Remote Sens. Environ.* 175:120-129.
- Biller, S.J., **L.D. McDaniel**, **M. Breitbart**, E. Rogers, **J.H. Paul**, S.W. Chisholm (2016). Membrane vesicles in seawater: heterogeneous DNA content and implications for viral abundance estimates. *ISME Journal*. doi: 10.1038/ismej.2016.134.

APPENDIX A. PUBLICATIONS

- Birk, M. A., C. Paight and **B. A. Seibel** (2016) Observations of multiple pelagic egg masses from small-sized jumbo squid (*Dosidicus gigas*) in the Gulf of California. *Journal of Natural History*. doi: 10.1080/00222933.2016.1209248.
- Bockus, A. and **B. A. Seibel** (2016) Trimethylamine oxide and lipid levels increase with depth in Hawaiian midwater fishes. *Deep-sea Res* 112: 37-44.
- Bonnain, C., **M. Breitbart**, **K.N. Buck** (2016) The ferrojan horse hypothesis: iron-virus interactions in the ocean. *Frontiers in Marine Science*. 3: 82.
- Buck, K.N.**, L.J.A. Gerringa, and M.J.A. Rijkenberg (2016) An intercomparison of dissolved iron speciation at the Bermuda Atlantic Time-series Study (BATS) site: Results from GEOTRACES Crossover Station A. *Frontiers in Marine Biogeochemistry*, 3: article 262, doi: 10.3389/fmars.2016.00262.
- Canals, M., D. Amblas, **E. W. Domack**, G. Lastras, C. Lavoie, J. L. Casamor, & C. Smith (2016) The seafloor imprint of the Gerlache – Boyd Ice Stream (65–62° S), northern Antarctic Peninsula. *Geological Society, London, Memoirs*, 46:477-484, doi:10.1144/M46.174.
- Caprara, S., **K.N. Buck**, L.J.A. Gerringa, M.J.A. Rijkenberg, and D. Monticelli (2016) A compilation of iron speciation data for open oceanic waters. *Frontiers in Marine Science*, 3: article 221, doi: 10.3389/fmars.2016.00221.
- Carey, S., R. Olsen, K.L. Bell, R. Ballard, F. Dondin, C. Roman, C. Smart, M. Lilley, J. Lupton, **B. A. Seibel** and W. Cornell (2016) Hydrothermal venting and mineralization in the crater of Kick'em Jenny submarine volcano, Grenada (Lesser Antilles). *Geochemistry, Geophysics, Geosystems*. 17, 1000-1019.
- Lee, CC, S. C. Sheridan, **B. B. Barnes**, **C. Hu**, D. E. Pirhalla, V. Ransibrahmanakul, K. Shein (2016) The development of a non-linear auto-regressive model with exogenous input (NARX) to model climate- water clarity relationships: reconstructing an historical water clarity index for the coastal waters of the southeastern US. *Theor. Appl. Climatol*. doi:10.1007/s00704-016-1906-7.
- Chacin, D.H. and **C.D. Stallings** (2016) Disentangling fine- and broad-scale effects of habitat on predator-prey interactions. *Journal of Experimental Marine Biology and Ecology* 483:10-19.
- Chacin, D.H., T.S. Switzer, **C.H. Ainsworth**, and **C.D. Stallings** (2016) Long-term retrospective analysis of spatio-temporal patterns in population dynamics and demography of juvenile Pinfish (*Lagodon rhomboides*). *Estuarine, Coastal, and Shelf Science* 183: 52-61.
- Chen, J., Z. Lee, **C. Hu**, and J. Wei (2016) Improving satellite data products for open oceans with a scheme to correct the residual errors in remote sensing reflectance, *J. Geophys. Res. Oceans*, 121, 3866–3886, doi:10.1002/2016JC011673.
- Chen, S., **C. Hu**, **R. H. Byrne**, L. L. Robbins, and B. Yang (2016) Remote estimation of surface pCO₂ on the West Florida Shelf. *Cont. Shelf. Res.*, 128:10-25. <http://dx.doi.org/10.1016/j.csr.2016.09.004>.
- Cook, M.M., E.M. Symonds, B. Gerber, **E.S. Van Vleet**, **M. Breitbart** (2016). Removal of six estrogenic endocrine-disrupting compounds (EDCs) from municipal wastewater using aluminum electrocoagulation. *Water*. 8:128.
- Daly, K.L.**, U. Passow, J. Chanton, and **D. Hollander** (2016) Assessing the impacts of oil-associated marine snow formation and sedimentation during and after the Deepwater Horizon oil spill. *Anthropocene* 13, 18-33, <http://dx.doi.org/10.1016/j.ancene.2016.01.006>.
- Deck, C. A., A. B. Bockus, **B. A. Seibel**, and P. J. Walsh (2016) Effects of short-term hyper- and hypo-osmotic exposure on the osmoregulatory strategy of unfed North Pacific spiny dogfish (*Squalus suckleyi*). *Comparative Biochemistry and Physiology A*. 193, 29-35.
- Dimiza, M.D., M.V. Triantaphyllou, O. Koukousioura, **P. Hallock**, N. Simboura, A.P. Karageorgis, and E. Papathanasiou, (2016) The Foram Stress Index: A new tool for environmental assessment of soft-bottom environments using benthic Foraminifera. A case study from the Saronikos Gulf, Greece, Eastern Mediterranean. *Ecol. Indi*. 60, 611-621, doi: 10.1016/j.ecolind.2015.07.030.
- Domack, E. W.**, 2016, Climate Science: A great Arctic ice shelf, *Nature*, 530, 163-164.

APPENDIX A. PUBLICATIONS

- Domack, E. W.**, D. Amblas & M. Canals (2016) Bedrock meltwater channels in Palmer Deep, Antarctic Peninsula. *Geological Society, London, Memoirs*, 46:211-212, doi:10.1144/M46.52
- Dornberger, L.**, **C. Ainsworth**, S. Gosnell and F. Coleman (2016) Developing a polycyclic aromatic hydrocarbon exposure dose-response model for fish health and growth. *Marine Pollution Bulletin*, 109(1): 259-266.
- Douglas, N.K.** and **R.H. Byrne**. (2017) Achieving accurate spectrophotometric pH measurements using unpurified meta-cresol purple. *Marine Chemistry*, 190: 66-72.
- Drury, A.J., John, C.M., and **A.E. Shevenell** (2016; online 2015) Evaluating climatic response to external radiative forcing during the late Miocene to early Pliocene: New perspectives from eastern equatorial Pacific (IODP U1338) and North Atlantic (ODP 982) locations. *Paleoceanography* 31, 167-184.
- Evans, M.; Liu, J.; Bacos, H.; **Rosenheim, B.E.**; Liu, Z. (2016) "Petroleum hydrocarbon persistence following the Deepwater Horizon oil spill as a function of shoreline energy." *Marine Pollution Bulletin*. doi:10.1016/j.marpolbul.2016.11.022.
- Fassbender, A.A., S. Alin, R.A. Feely, A.J. Sutton, J.A. Newton, **R.H. Byrne** (2017). (in press). Estimating Total Alkalinity in the Washington State Coastal Zone: Complexities and Surprising Utility for Ocean Acidification Research. *Estuaries and Coasts* (in press) DOI 10.1007/s12237-016-0168-z.
- Feely, R.A., S. Alin, D. Carter, N. Bednarsek, B. Hales, F. Chan, T.M. Hill, B. Gaylord, E. Sanford, **R.H. Byrne**, C.L. Sabine, D. Greeley, and L. Juranek. (2017). (in press). Chemical and Biological Impacts on Ocean Acidification Along the West Coast of North America. *Estuarine, Coastal and Shelf Science*.
- Feng, L., and **C. Hu** (2016). Cloud adjacency effects on top-of-atmosphere radiance and ocean color data products: A statistical assessment. *Remote Sens. Environ.*, 174:301-313. doi:10.1016/j.rse.2015.12.020.
- Feng, L., and **C. Hu** (2016). Comparison of Valid Ocean Observations Between MODIS Terra and Aqua Over the Global Oceans. *IEEE Trans. Geosci. Remote Sens.* 54:1575-1585.
- Feng, L., X. Han, **C. Hu**, and X. Chen (2016) Four decades of wetland changes of the largest freshwater lake in China: Possible linkage to the Three Gorges Dam? *Remote Sens. Environ.*, 176:43-55. doi:10.1016/j.rse.2016.01.011.
- Galperin, B.**, J. Hoemann, S. Espa, G. DiNitto, and G. Lacorata, (2016) Anisotropic macroturbulence and diffusion associated with a westward zonal jet: From laboratory to planetary atmospheres and oceans. *Physical Review E*, 94, 063102. doi: 10.1103/PhysRevE.94.063102.
- Gilbert, S.**, **B. Prueitt**, L. Hotaling, **T. Greely**, **S. Murawski**, **D. Hollander**, (2016) Communicating Oil Spill Science- Using C-IMAGE for interdisciplinary education and outreach, Marine Technology Society Oceans Conference Paper, *Journal of the Institute of Electrical and Electronics Engineers (IEEE)*, 1-6.
- Gruss, A., S.R. Sagarese, **M. Drexler**, E. Babcock, D. Chagaris, **C.H. Ainsworth**, B. Penta, S. deRada (2016). Improving the spatial allocation of functional group biomasses in spatially-explicit ecosystem models: insights from the Gulf of Mexico. *Bulletin of Marine Science*, 4: 473-496.
- Guitard, M. E.**, **A. E. Shevenell**, C. Lavoie, & **E. W. Domack** (2016) Mega-scale glacial lineations and grounding-zone wedges in Prydz Channel, East Antarctica. *Geological Society, London, Memoirs*, 46:185-186, doi:10.1144/M46.110.
- Guzmán L, R. Varela, **F. Muller-Karger**, **L. Lorenzoni** (2016) Bio-optical characteristics of a red tide induced by *Mesodinium rubrum* in the Cariaco Basin, Venezuela. *Journal of Marine Systems*. 160.
- Hall-Scharf, B.J., T.S. Switzer, and **C.D. Stallings** (2016) Ontogenetic and long-term diet shifts of a predatory fish in an urban estuary undergoing dramatic changes in water quality and habitat dynamics. *Transactions of the American Fisheries Society* 145: 502-520.
- Hastings, D. W., **P. T. Schwing**, G. R. Brooks, R. A. Larson, J. L. Morford, T. Roeder, K. A. Quinn, T. Bartlett, I. C. **Romero**, and **D. J. Hollander** (2016) Changes in sediment redox conditions following the BP DWH blowout event. *Deep Sea Research Part II: Topical Studies in Oceanography*, 129, 167-178, doi:10.1016/j.dsr2.2014.12.009.

APPENDIX A. PUBLICATIONS

- Hiester, H. R., S. L. Morey, D. S. Dukhovskoy, E. P. Chassignet, V. H. Kourafalou and **C. Hu** (2016) A topological approach for quantitative comparisons of ocean model fields to satellite ocean color data. *Methods in Oceanography*, 17:232-250. <http://dx.doi.org/10.1016/j.mio.2016.09.005>.
- Hu, C., B. B. Barnes**, L. Qi, C. Lembke, and D. English (2016). Vertical migration of *Karenia brevis* in the northeastern Gulf of Mexico observed from glider measurements. *Harmful Algae*. 58:59-65, doi:10.1016/j.hal.2016.07.005.
- Hu, C.**, B. Murch, A. A. Corcoran, L. Zheng, **B. B. Barnes**, **R. H. Weisberg**, K. Atwood, J. M. Lenes (2016) Developing a smart semantic web with linked data and models for near real-time monitoring of red tides in the eastern Gulf of Mexico. *IEEE Systems Journal*, 10:1282 - 1290. doi:10.1109/JSYST.2015.2440782.
- Hu, C.**, B. Murch, **B. B. Barnes**, **M. Wang**, J-P. Marechal, J. Franks, D. Johnson, B. Lapointe, D. S. Goodwin, J. M. Schell, and A. N. S. Siuda (2016). Sargassum watch warns of incoming seaweed, *Eos*, 97(22):10-15, <http://dx.doi.org/10.1029/2016EO058355>.
- Hu, C.**, R. Hardy, E. Ruder, A. Geggel, L. Feng, S. Powers, F. Hernandez, G. Graettinger, J. Bodnar, and T. McDonald (2016) Sargassum coverage in the northeastern Gulf of Mexico during 2010 from Landsat and airborne observations: Implications for the Deepwater Horizon oil spill impact assessment. *Marine Pollution Bulletin*, 107:15-21. DOI information: 10.1016/j.marpolbul.2016.04.045.
- Hunt, G.L. Jr., K.F. Drinkwater, K. Arrigo, J. Berge, **K.L. Daly**, S. Danielson, M. Daase, H. Hop, E. Isla, N. Karnovsky, K. Laidre, E. Murphy, F. Mueter, P. Renaud, W. Smith, P. Trathan, D. Wolf-Gladrow (2016) Advection in polar and sub-polar environments: Impacts on high latitude marine ecosystems. *Progr. Oceanogr.* 149, 40-81, doi:10.1016/j.pocean.2016.10.004.
- Jerabek, A.S., **K.R. Wall**, and **C.D. Stallings** (2016) Low-copper antifouling paints as an alternative to frequent maintenance of experimental field apparatuses. *PeerJ* 4:e2213.
- Paul, J. H.** (2016) Phytoplankton gene expression. In *Microalgae: Current Research and Applications*. M.N. Tsaloglou, ed. *Horizon Scientific press*: 27-43
- Judkins, H. L., M. Vecchione, and **K. Rosario** (2016) Morphological and molecular evidence of *Heteroteuthis dagamensis* in the Gulf of Mexico. *Bulletin of Marine Science*. 92 (1), 51-57, doi: 10.5343/bms.2015.1061.
- Kavanaugh, M.T., M J. Oliver, F. P. Chavez, R.M. Letelier, **F.E. Muller-Karger**, S.C. Doney (2016) Seascapes as a new vernacular for ocean monitoring, management and conservation. *ICES Journal of Marine Science*. doi:10.1093/icesjms/fsw086.
- Kosempa, M.**, and **D. P. Chambers** (2016) Mapping error in Southern Ocean transport computed from satellite altimetry and Argo, *J. Geophys. Res. Oceans*, 121, doi:10.1002/2016JC011956.
- Lavoie, C., **Domack, E. W.**, Heirman, K., Naudts, L. & Brachfeld, S., 2016, A Holocene volcanic knoll within a glacial trough, Antarctic Sound, northern Antarctic Peninsula. *Geological Society, London, Memoirs*, 46:125-126, doi:10.1144/M46.130.
- Le, C., J. C. Lehrter, B. A. Schaeffer, **C. Hu**, M. C. Murrell, J. D. Hagy, R. M. Greene, and M. Beck (2016) Bio-optical water quality dynamics observed from MERIS in Pensacola Bay, Florida. *Estuarine, Coastal and Shelf Science*. 173:26-38. doi:10.1016/j.ecss.2016.02.003.
- Le, C., J. C. Lehrter, **C. Hu**, and D. R. Obenour (2016) Satellite-based empirical models linking river plume dynamics with hypoxic area and volume, *Geophys. Res. Lett.*, 43, 2693–2699, doi:10.1002/2015GL067521.
- Li, M., Y. J. Lee, J. M. Testa, Y. Li, W. M. Kemp, and D. M. Di Toro, (2016) What Drives Interannual Variability of Estuarine Hypoxia: Climate Forcing Versus Nutrient Loading? *Geophys. Res. Lett.*, 43, 2127–2134, doi:10.1002/2015GL067334.
- Li, X., **C. Hu**, S. Bao, and X. Yang (2016) MODIS captures large-scale atmospheric gravity waves over the Atlantic Ocean. *Acta Oceanol. Sin.*, 35:1-2.
- Li, Y.**, R. Ji, S. Jenouvrier, M. Jin, and J. Stroeve, (2016) Synchronicity between ice retreat and phytoplankton bloom in circum-Antarctic polynyas, *Geophys. Res. Lett.*, 43, 2086–2093, doi:10.1002/2016GL067937.

APPENDIX A. PUBLICATIONS

- Liang, X.**, and L. Yu (2016), Variations of the global net air–sea heat flux during the “Hiatus” period (2001–10). *J. Clim.*, 29, 3647–3660, doi:10.1175/JCLI-D-15-0626.1.
- Liu, Y., R.H. Weisberg**, J.M. Lenos, L. Zheng, K. Hubbard, and J.J. Walsh (2016) Offshore forcing on the "pressure point" of the West Florida Shelf: Anomalous upwelling and its influence on harmful algal blooms, *J. Geophys. Res.-Oceans*, <http://dx.doi.org/10.1002/2016JC011938>.
- Liu, Y., R.H. Weisberg**, S. Vignudelli, G.T. Mitchum (2016) Patterns of the Loop Current System and Regions of Sea Surface Height Variability in the Eastern Gulf of Mexico Revealed by the Self-Organizing Maps, *J. Geophys. Res.*, 121, 2347-2366, doi:10.1002/2015JC011493.
- Liu, Y.**, S.-K. Lee, D. B. Enfield, B. A. Muhling, J. T. Lamkin, **F. E. Muller-Karger**, and M. A. Roffer, (2016) Past and future climate variability in the Intra-Americas Sea and its impact on the marine ecosystem and fisheries, *US CLIVAR Variations*, Vol. 14, No. 1, 27-32.
- Loïc, B., X. Crosta, A. Leventer, S. Schmidt, J. Etourneau, **E. W. Domack**, G. Massé, (2016) Environmental responses of the Northeast Antarctic Peninsula to the Holocene climate variability. *Paleoceanography*, 31(1), 131-147.
- Lu, Y., **C. Hu**, S. Sun, M. Zhang, Y. Zhou, J. Shi, and Y. Wen (2016) Overview of optical remote sensing of marine oil spills and hydrocarbon seepage. *Journal of Remote Sensing*, 20(5):1259-1269 [DOI:10.11834/jrs.20166122].
- Lu, Y., L. Li, **C. Hu**, L. Li, **M. Zhang**, **S. Sun**, and C. Lv (2016), Sunlight induced chlorophyll fluorescence in the near-infrared spectral region in natural waters: Interpretation of the narrow reflectance peak around 761 nm, *J. Geophys. Res. Oceans*, 121, 5017–5029, doi:10.1002/2016JC011797.
- Lu, Y., S. Sun, M. Zhang, B. Murch, and **C. Hu** (2016), Refinement of the critical angle calculation for the contrast reversal of oil slicks under sunglint, *J. Geophys. Res. Oceans*, 121, 148–161, doi:10.1002/2015JC011001.
- Lu, Y., W. Zhan, and **C. Hu** (2016). Detecting and quantifying oil slick thickness by thermal remote sensing: A ground-base experiment. *Remote Sens. Environ.*, 181: 207-217, doi:10.1016/j.rse.2016.04.007.
- Masi, M.D., C.H. Ainsworth, D.L. Jones** (2016) Using a Gulf of Mexico Atlantis model to evaluate ecological indicators for sensitivity to fishing mortality and robustness to observation error. *Ecological Indicators*, 74: 516-525.
- McMullen, K., **E. W. Domack**, A. Leventer, C. Lavoie & M. Canals, (2016) Grounding-zone wedges and mega-scale glacial lineations in the Mertz Trough, East Antarctica. *Geological Society, London, Memoirs*, 46:241-242, doi:10.1144/M46.175.
- Merrifield, M.A., E. Leuliette, P. Thompson, **D.P. Chambers**, B. Hamlington, S. Jevrejeva, J.J. Marra, M. Menéndez, **G.T. Mitchum**, R.S. Nerem and W. Sweet (2016) Sea level variability and change, in “State of the Climate in 2015”, *Bull. Amer. Met. Soc.*, 97(8), S80-82.
- Montes, E., F. Muller-Karger**, M. W. Lomas, A. Cianca, L. Lorenzoni, S. Habtes. (2016) Decadal variability in the oxygen inventory of North Atlantic Subtropical Underwater captured by sustained, long-term oceanographic time-series observations. *Global Biogeochemical Cycles*. DOI 10.1002/2015GB005183.
- Moss J., C. McCurry; S. Tominack, **I.C Romero; D.J. Hollander**; W.H Jeffrey; R.A Snyder. (2016) Ciliate protists from the sediment-water interface in the Northeastern Gulf of Mexico. *Deep Sea Research Part I: Oceanographic Research Papers*, 106, 85–96. <http://www.sciencedirect.com/science/article/pii/S096706371500165X>.
- Moss J., C. McCurry; S. Tominack, **I.C Romero; D.J. Hollander**; W.H Jeffrey; R.A Snyder (2016) Ciliate protists from the sediment-water interface in the Northeastern Gulf of Mexico. *Deep Sea Research Part I: Oceanographic Research Papers*, 106, 85–96. <http://www.sciencedirect.com/science/article/pii/S096706371500165X>.
- Muhling, Barbara A., Richard Brill, John T. Lamkin, Mitchell A. Roffer, Sang-Ki Lee, Yanyun Liu, **Frank Muller-Karger**. (2016) Projections of future habitat use by Atlantic bluefin tuna: mechanistic vs. correlative distribution models. *ICES Journal of Marine Science*. doi:10.1093/icesjms/fsw215.

APPENDIX A. PUBLICATIONS

- Murawski S.A.**, J. Fleeger, W. Patterson, III, **C. Hu**, **K. Daly**, **I.C. Romero**, **G.A. Toro-Farmer**. (2016) How Did the Deepwater Horizon Oil Spill Affect Coastal and Continental Shelf Ecosystems. *Oceanography* 29 (3): 161-173.
- Netchy, K., **P. Hallock**, K.S. Lutz, and **K.L. Daly** (2016) Epibenthic mobile invertebrate diversity organized by coral habitat in Florida. *Mar. Biodivers.* 46,451-463, doi: 10.1007/s12526-015-0388-7.
- O'Brien, P.E., R. Beaman, L. DeSantis, **E. Domack**, C. Escutia, P.T. Harris, A. Leventer, K. McMullen, A. Post, P.G. Quilty, **A.E. Shevenell**, and C. Batchelor (2016) Submarine glacial landforms on the cold East Antarctic margin. In Dowdeswell, J.A., Canals, M., Jakobsson, M., Todd, B.J., Dowdeswell, E.K. & Hogan, K.A. (eds) Atlas of Submarine Glacial Landforms: Modern, Quaternary and Ancient. *Geological Society*, London, Memoirs, 46, 501-508.
- O'Connor, B.S., **F.E. Müller-Karger**, R.W. Nero, **C. Hu**, and **E.B. Peebles** (2016) The role of Mississippi River discharge in offshore phytoplankton blooming in the northeastern Gulf of Mexico during August 2010. *Remote Sensing of Environment* 173, 133–144. <http://dx.doi.org/10.1016/j.rse.2015.11.004>.
- O'Farrell, S., J.N. Sanchirico, I. Chollett, **M. Cockrell**, **S.A. Murawski**, J.T. Watson, A. Haynie, A. Strelcheck, and L. Perruso. 2016 Improving detection of short-duration fishing behaviour in vessel tracks by feature engineering of training data. *ICES Journal of Marine Science* doi:10.1093/icesjms/fsw244.
- Overholt W.A., K.P. Marks, **I.C. Romero**, **D.J. Hollander**, T.W. Snella, J.E. Kostka (2016) Hydrocarbon Degrading Bacteria Exhibit a Species Specific Response to Dispersed Oil while Moderating Ecotoxicity. *Applied and Environmental Microbiology*, 82/2, DOI: 10.1128/AEM.02379-15.
- Patten, J.T. and **R. H. Byrne**. 2017 (in press). Assessment of Fe(III) and Eu(III) Complexation by Silicate in Aqueous Solutions. *Geochemica et Cosmochemica Acta*. <http://dx.doi.org/10.1016/j.gca.2016.12.004>.
- Post, A. L., C. Lavoie, **E. W. Domack**, A. Leventer, **A. Shevenell**, A. D. Fraser (2016) Environmental drivers of benthic communities and habitat heterogeneity on an East Antarctic shelf, *Antarctic Science* · DOI: 10.1017/S0954102016000468.
- Post, A.L., C. Lavoie, **E.W. Domack**, A. Leventer, **A.E. Shevenell**, and the NBP14-02 Science Team (2017; 2016 Online). Benthic community structure and habitat heterogeneity on the Sabrina Coast continental shelf, East Antarctica. *Antarctic Science* 29, 17-32.
- Price, S.E., M. J. Hoffman, **J. A. Bonin**, I. M. Howat, T. Neumann, J. Saba, I. Tezaur, J. Guerber, **D. P. Chambers**, K. J. Evans, J. H. Kennedy, J. Lenaerts, W. H. Lipscomb, M. Perego, A. G. Sallinger, R. S. Tuminaro, M. R. van den Broeke, and S. M. J. Nowicki (2016) An ice sheet model validation framework for the Greenland ice sheet, *Geosci. Model Dev.*, 9, 1–16, doi:10.5194/gmd-9-1-2016.
- Qi, L., **C. Hu**, Q. Xing, and S. Shang (2016) Long-term trend of *Ulva prolifera* blooms in the western Yellow Sea. *Harmful Algae*, 58:35-44. <http://dx.doi.org/10.1016/j.hal.2016.07.004>.
- Qiu, Z., D. Sun, **C. Hu**, S. Wang, L. Zheng, Y. Huan, and T. Peng (2016). Variability of Particle Size Distributions in the Bohai Sea and the Yellow Sea. *Remote Sens.* 2016, 8(11), 949; doi:10.3390/rs8110949.
- Robbins, L.L, P.O. Knorr**, J.G. Wynn, **P. Hallock** and P.J. Harries (2016) Interpreting the role of pH on stable isotopes in benthic foraminifera: Challenges of phylogeny, ontogeny and algal symbiosis. *ICES J. Mar. Sci.*, doi:10.1093/icesjms/fsw056.
- Romero I.C.**, T. Özgökmen, **S. Snyder**, **P. Schwing**, B.J. O'Malley, F.J. Beron-Vera, M.J. Olascoaga, P. Zhu, E. Ryan, S. Chen, D.L. Wetzel, **D.J. Hollander**, **S.A. Murawski**. (2016) Geochemical signatures of a Marine Gas Well Blowout in the Gulf of Mexico. *J. Geophys. Res. Oceans*, 121, DOI: 10.1002/2015JC011037.
- Romero, I.C.**, T. Ozgokmen, **S. Snyder**, **P.T. Schwing**, B.J. O'Malley, F.J. Beron-Vera, M.J. Olascoaga, P. Zhu, E. Ryan, S. Chen, D. Wetzel, **D.J. Hollander**, **S.A. Murawski** (2016) Tracking the Hercules 265 Marine Gas Well Blowout in the Gulf of Mexico. *Journal of Geophysical Research-Oceans*, doi: 10.1002/2015JC011037.
- Rosario, K.**, C. Marr, A. Varsani, S. Kraberger, D. Stainton, E. Moriones, J. E. Polston, and **M. Breitbart** (2016) Begomovirus-associated satellite DNA diversity captured through vector-enabled metagenomic (VEM) surveys using whiteflies (Aleyrodidae). *Viruses*. 8 (2), 36, doi: 10.3390/v8020036.

APPENDIX A. PUBLICATIONS

- Rosenheim, B.E.**; M.A. Pendergraft; G.C. Flowers; R. Carney; J. Sericano; R.M. Amer; J. Chanton; Z. Dincer; T.L. Wade (2016) "Employing extant stable carbon isotope data in Gulf of Mexico sedimentary organic matter for oil spill studies." *Deep Sea Research II*, doi:10.1016/j.dsr2.2014.03.020.
- Ross, B.J.**, and **P. Hallock** (2016) Dormancy in the Foraminifera: A review. *J. Foramin. Res.* 46, 358-368, WOS:000386865500002.
- Roux, S., N. Solonenko, V.T. Dang, B.T. Poulos, S.M. Schwenck, D.B. Goldsmith, M.L. Coleman, **M. Breitbart**, M.B. Sullivan. (2016) Towards quantitative viromics for both double-stranded and single-stranded DNA viruses. *PeerJ.* 4:e2777.
- Rubec, P.J., J. Lewis, D. Reed, C. Santi, **R.H. Weisberg**, L. Zheng, C. Jenkins, C.F. Ashbaugh, C. Lashley, S. Versaggi (2016) Linking Oceanographic Modeling and Benthic Mapping with Habitat Suitability Models for Pink Shrimp on the West Florida Shelf, Marine and Coastal Fisheries: *Dynamics, Management, and Ecosystem Science*, 8, 160-176, doi: 10.1080/19425120.2015.1082519.
- Schwartz, M. and **D.J. Hollander**, (2016) The Uruk Expansion as Dynamic Process: A Reconstruction of Middle to Late Uruk Exchange Patterns From Bulk Stable Isotope Analyses of Bitumen Artifacts, *Journal of Archaeological Sciences*, Special Issue, Report 7, 884-899. DOI: 10.1016/j.jasrep.2016.01.02.
- Schwing P., I.C. Romero**, R. Larson, B. O'Malley, E. Fridrik, **E.A. Goddard**, G. Brooks, D. Hastings, **B. Rosenheim**, B. Hollander, G. Grant, J. Mulhollan (2016) Sediment core extrusion method at millimeter resolution using a calibrated, treaded-rod. *Journal of Visualized Experiments* (114), e54363, doi:10.3791/54363.
- Schwing, P.T.**, B.J. O'Malley, **I.C. Romero**, **M. Martínez-Colón**, D.W. Hastings, M.A. Glabach, E.M. Hladky, **A. Greco**, **D.J. Hollander** (2016) Characterizing the variability of benthic foraminifera in the northeastern Gulf of Mexico following the Deepwater Horizon event (2010-2012). *Environ. Sci. Pollut. Res.*, DOI 10.1007/s11356-016-7996-z.
- Seibel, B. A.** (2016) Cephalopod susceptibility to asphyxiation via ocean incalcescence, deoxygenation and acidification. *Physiology* 31, 418–429.
- Seibel, B. A.**, J.A. Schneider, S. Kartvedt, K. Wishner, K.L. Daly. (2016) Hypoxia tolerance in oxygen minimum zone euphausiids: implications for ocean deoxygenation and biogeochemical cycles. *Integrative and Comparative Biology*, 1–14; doi:10.1093/icb/icw091.
- Shevenell, A.E.** (2016) Commentary: Drilling and Modeling studies expose Antarctica's Miocene secrets. *Proceed. Nat. Acad. Sci.* 113 (13), 3419-3421.
- Simard, P., **K.R. Wall**, D.A. Mann, C.C. Wall, and **C.D. Stallings** (2016) Boat visitation rates at artificial and natural reefs in the eastern Gulf of Mexico using acoustic recorders. *PLoS One* 11:e0160695.
- Soli, A.L. and **R.H. Byrne**. 2017 (in press). Europium silicate complexation at 25 oC and 0.7 molar ionic strength. *Marine Chemistry*.
- Soto, Inia, Frank E. Muller-Karger, Chuanmin Hu**, Jennifer Wolny. (2016) Characterization of *Karenia brevis* blooms on the West Florida Shelf using ocean color satellite imagery: Implications for bloom maintenance and evolution. *Journal of Applied Remote Sensing*. 11(1), 012002. doi:10.1117/1.JRS.11.012002.
- Spooner, P.; W. Guo; L.F. Robinson; N. Thiagarajan; K. Hendry; **B.E. Rosenheim**; M.J. Leng; (2016) "Clumped isotope composition of cold-water corals: A role for vital effects?" *Geochimica et Cosmochimica Acta*. doi: 10.1016/j.gca.2016.01.023.
- Stallings, C.D., E.B. Peebles, O. Ayala, J.S. Curtis, and K.R. Wall** (2016) Lunar periodicity in spawning of White Grunt, *Haemulon plumieri*. *Bulletin of Marine Science* 92: 545-550.
- Subt, C.**; K. Fangman; J. Wellner; **B.E. Rosenheim** (2016). "Sediment chronology in Antarctic deglacial sediments: Reconciling organic carbon 14C ages to carbonate 14C ages using Ramped PyrOx." *The Holocene*. v. 26, n. 2, p. 265-273. doi: 10.1177/0959683615608688
- Sukoriansky, S., and **B. Galperin**, 2016 QNSE theory of turbulence anisotropization and onset of the inverse energy cascade by solid body rotation. *Journal of Fluid Mechanics*, 805, 384-421. doi:10.1017/jfm.2016.568.

APPENDIX A. PUBLICATIONS

- Sun, D., Z. Qiu, **C. Hu**, S. Wang, L. Wang, L. Zheng, T. Peng, and Y. He (2016) A hybrid method to estimate suspended particle sizes from satellite measurements over Bohai Sea and Yellow Sea, *J. Geophys. Res. Oceans*, 121, 6742–6761, doi:10.1002/2016JC011949.
- Sun, H., Q. Yang, W. Zhao, **X. Liang**, and J. Tian (2016) Temporal variability of diapycnal mixing in the northern South China Sea, *J. Geophys. Res. Oceans*, 121, 8840–8848, doi:10.1002/2016JC012044.
- Sun, S., and **C. Hu** (2016), Sun glint requirement for the remote detection of surface oil films, *Geophys. Res. Lett.*, 43, 309–316, doi:10.1002/2015GL066884.
- Sun, S., **C. Hu**, **L. Feng**, G.A. Swayze, J. Holmes, G. Graettinger, I. MacDonald, O. Garcia, and I. Leifer (2016) Oil slick morphology derived from AVIRIS measurements of the Deepwater Horizon oil spill: Implications for spatial resolution requirements of remote sensors. *Mar. Pollut. Bull.*, 103: 276-285, doi:10.1016/j.marpolbul.2015.12.003.
- Symonds, E., C. Sinigalliano, M. Gidley, W. Ahmed, S.M. McQuaig-Ulrich, **M. Breitbart** (2016) Faecal pollution along the southeastern coast of Florida and insight into the use of pepper mild mottle virus as an indicator. *Journal of Applied Microbiology*. 121: 1469-1481.
- Szekely, A. and **M. Breitbart** (2016) Single-stranded DNA phages: from early molecular biology tools to recent revolutions in environmental microbiology. *FEMS Microbiology Letters*. 363: fnw027.
- Tarnecki, J., A. Wallace, J. D. Simons and **C.H. Ainsworth** (2016) Progression of a Gulf of Mexico Food Web Supporting Atlantis Ecosystem Model Development. *Fisheries Research*, 179: 237-250.
- Tastula, E.-M., M.A. LeMone, J. Dudhia and **B. Galperin**, 2016 The impact of the QNSE-EDMF scheme and its modifications on boundary layer parameterization in WRF: modeling of CASES-97. *Quarterly Journal of the Royal Meteorological Society*, 142, 1182–1195. doi:10.1002/qj.2723.
- Toro-Farmer, Gerardo, Frank E. Muller-Karger**, Maria Vega-Rodríguez, Nelson Melo, Kimberly Yates, Sergio Cerdeira-Estrada, and Stanley R. Herwitz. 2016. Characterization of Available Light for Seagrass and Patch Reef Productivity in Sugarloaf Key, Lower Florida Keys. *Remote Sens.* (2016) 8(2), 86; doi:10.3390/rs8020086.
- Tzadik, O.E., **E.B. Peebles**, and **C.D. Stallings** (2016) Life-history studies by non-lethal sampling: using microchemical constituents of fin rays as chronological recorders. *Journal of Fish Biology* 90, 611–625. doi:10.1111/jfb.13156.
- Tzadik, O.E., J.S. Curtis, J.E. Granneman, B.N. Kurth, T.J. Pusack, A.A. Wallace, **D.J. Hollander**, **E.B. Peebles**, and **C.D. Stallings**. (2016) Chemical archives in fishes beyond otoliths: A review on the use of other body parts as chronological recorders of microchemical constituents for expanding interpretations of environmental, ecological, and life-history changes. *Limnology and Oceanography: Methods*. DOI: 10.1002/lom3.10153.
- Ulm, M., A. Arns, T. Wahl, S. D. Meyers, **M. E. Luther**, J. Jensen (2016) The Impact of a Barrier Island Loss on Extreme Events in the Tampa Bay, *Frontiers of Marine Science*, doi: 10.3389/fmars.2016.00056.
- Valente, A., et al. (2016) A compilation of global bio-optical in situ data for ocean-colour satellite applications. *Earth System Science Data (ESSD)*. 8, 235-252, doi:10.5194/essd-8-235-2016.
- Verbyla, M.E., E.M. Symonds, R.C. Kafle, M.R. Cairns, M. Iriarte, A. Mercado, O. Coronado, **M. Breitbart**, C. Ledo, J.R. Mihelcic (2016) Managing microbial risks from indirect wastewater reuse for irrigation in urbanizing watersheds. *Environmental Science and Technology*. 50: 6803-6813.
- von Schuckmann, K., M. D. Palmer, K. E. Trenberth, A. Cazenave, **D. Chambers**, N. Champollion, J. Hansen, S. A. Josey, N. Loeb, P.-P. Mathieu, B. Meyssignac, M. Wild (2016) An imperative to monitor Earth's energy imbalance, *Nature Climate Change*, 6, 138-144, doi:10.1038/nclimate2876.
- Wahl, T., and **D. P. Chambers** (2016) Climate controls multi-decadal variability in U.S. extreme sea level records, *J. Geophys. Res. Oceans*, 121, doi:10.1002/2015JC011057.
- Walsh J.J., J.M. Lenos, B. Darrow, A. Parks, and **R.H. Weisberg** (2016) Impacts of combined overfishing and oil spills on the plankton trophodynamics of the West Florida shelf over the last half century of 1965-2011: A two dimensional simulation analysis. *Cont. Shelf Res.* 116, 54-73.

APPENDIX A. PUBLICATIONS

- Wang, M., and **C. Hu** (2016) Mapping and quantifying Sargassum distribution and coverage in the Central West Atlantic using MODIS observations. *Remote Sens. Environ.*, 183:356-367. <http://dx.doi.org/10.1016/j.rse.2016.04.019>.
- Weber, S., J.J. Battles, L. Peterson, B.J. Roberts, R.N. Peterson, **D.J. Hollander**, J.P. Chanton, S.B. Joye, and J.P. Montoya, (2016) Hercules 265 Rapid Response: Immediate ecosystem impacts of a natural gas blowout incident, *Deep Sea Research II: Topical Studies in Oceanography*, DOI: 10.1016/j.dsr2.2015.11.010.
- Wee, J.L., Millie, D.F., Nguyen N.K., Patterson J., Cattolico R.A., John, D.E, and **J.H. Paul**. 2016. Growth and Biochemical Responses of *Skeletonema costatum* to Petroleum Contamination *Journal of Applied Phycology*, (), 1-13. DOI 10.1007/s10811-016-0902-8.
- Weisberg, R. H.**, L. Zheng, Y. Liu, A. A. Corcoran, **C. Lembke, C. Hu, J. M. Lenes**, and **J. J. Walsh** (2016) *Karenia brevis* blooms on the West Florida Shelf: A comparative study of the robust 2012 bloom and the nearly null 2013 event. *Cont. Shelf. Res.*, 120:106-121. doi:10.1016/j.csr.2016.03.011.
- Weisberg, R. H.**, L. Zheng, **Y. Liu, S. Murawski, C. Hu, D. Hollander**, and **J. Paul** (2016) Did Deepwater Horizon Hydrocarbons Transit to the West Florida Continental Shelf? *Deep-sea Research II*, 129:259-272, DOI: 10.1016/j.dsr2.2014.02.002.
- Weisberg, R.H.**, L. Zheng, and **Y. Liu** (2016) West Florida Shelf upwelling: Origins and pathways, *J. Geophys. Res. Oceans*, 121, 5672-5681, <http://dx.doi.org/10.1002/2015JC011384>.
- West, R., R. Winokur, F. Byus, J. Hughes-Clark, J. Crowley, B. Houtman, **S. Murawski**, B. Powell N. Rabalais, R. Schnoor, S. Ramberg and D. Vortmann. (2016) Final Report of Independent Review Team on NOAA Fleet Recapitalization.
- Wijerman, M., J.S. Link, E.A. Fulton, E. Olsen, H. Townsend, S. Gaichas, C. Hansen, M. Skern-Mauritzen, I.C. Kaplan, R. Gamble, G. Fay, M. Savina, **C.H. Ainsworth**, I. Van Putten, R. Gorton, R.E. Brainard, and T. Hutton (2016) Atlantis ecosystem model summit: report from a workshop. *Ecological Modelling*, 335: 35-38.
- Xing, Q., and **C. Hu** (2016) Mapping macroalgal blooms in the Yellow Sea and East China Sea using HJ-1 and Landsat data: Application of a virtual baseline reflectance height technique. *Remote Sens. Environ.*, 178:113-126. <http://dx.doi.org/10.1016/j.rse.2016.02.065>.
- Yang, Q., T. Dixon, P. Meyers, **J. Bonin, D. Chambers**, and M. van den Broeke (2016) Recent increases in Arctic freshwater flux affects Labrador Sea convection and Atlantic overturning circulation, *Nature Communications*, 7:10525, doi: 10.1038/ncomms10525.
- Yang, Q., W. Zhao, **X. Liang**, and J. Tian (2016) Three-dimensional distribution of turbulent mixing in the South China Sea. *J. Phys. Oceanogr*, 46, 769–788, doi:10.1175/JPO-D-14-0220.1.
- Zhang, M., **D. English, C. Hu**, P. Carlson, **F. E. Muller-Karger, G. Toro-Farmer**, and S. R. Herwitz (2016) Short-term changes of remote sensing reflectance in a shallow-water environment: observations from repeated airborne hyperspectral measurements, *International Journal of Remote Sensing*, 37:7, 1620-1638, DOI:10.1080/01431161.2016.1159746.
- Zielinski, B. A. Allen, E. J. Carpenter, V. Coles, B. Crump, M. Daugherty, R. Foster, J. Goes, H. Gomes, J. McCrow, J. Montoya, M. A. Moran, B. Satinsky, S. Sharma, C. Smith, S. Weber, T. Yager, **J. H. Paul** (2016) Patterns Of Microeukaryotic Gene Expression Derived From Metatranscriptome Analysis Parallels Biogeochemical Measurements In The Amazon River Plume. *PLoS One* Sept 6, 2016.

CMS OTHER WORKS AND REPORTS (4)

- Ainsworth, C.H.**, 2016. Peer review of EwE and CASM Mississippi River Delta Management Studies: Editors Report. Prepared for the Water Institute of the Gulf under project CPRA-2016-TO39-DR. University of South Florida. St. Petersburg, FL. 61 pp.

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Buck, K.N., C. Bonnain and R.M. Bundy (2016). Biogeochemical cycling of organic iron-binding ligands: Insights from GEOTRACES data in the Atlantic Ocean. Ocean Carbon and Biogeochemistry Newsletter, Summer. Invited article.

Kumar, R., S. Surma, T.J. Pitcher, D. Varkey, M. Lam, **C.H. Ainsworth**, and E. Pakhomov (2016) An ecosystem model of the ocean around Haida Gwaii, northern British Columbia: Ecopath, Ecosim and Ecospace. Institute for the Oceans and Fisheries, University of British Columbia, Canada. Fisheries Centre Research Reports.

Meselhe, E., K. Costanza, **C.H. Ainsworth**, D. Chagaris, D. Addis, E. Simpson, M. Rodrigue, H. Jung and J. Smits (2017) Models performance assessment metrics for the LCA Mississippi River hydrodynamic and delta management study. Report for the Coastal Protection and Restoration Authority. The Water Institute of the Gulf. Available: emeselhe@thewaterinstitute.org

APPENDIX B. ACTIVE RESEARCH AWARDS

Appendix B. Active Research Awards

Award PI Name	Co PI Name If Applicable	Sponsor Name	Actual Total Expenditures	Award Begin Date	Award End Date
Ainsworth		Alfred P. Sloan Foundation	9893.06	9/15/2013	9/14/2017
Ainsworth		Texas A & M University	71252.00	9/1/2013	8/31/2016
Ainsworth		Stratus Consulting	2678.28	3/20/2014	9/22/2016
Ainsworth		NOAA	11027.35	9/1/2015	8/31/2017
Ainsworth		University of Miami	17336.77	9/1/2015	11/30/2017
Barnes	Hu	Kent State University	11145.16	5/1/2016	4/30/2017
Bonin		NASA	102307.42	5/5/2014	8/14/2017
Breitbart		National Science Foundation	116773.59	12/1/2012	11/30/2017
Breitbart		National Science Foundation	2543.08	12/1/2012	11/30/2017
Breitbart		US Israel Binational Science Foundation	17876.95	9/1/2015	8/31/2019
Breitbart		National Science Foundation	11645.37	7/1/2016	6/30/2017
Breitbart		National Science Foundation	21453.57	9/15/2016	9/14/2017
Kramer	Breitbart	US Department of Treasury	21796.44	9/1/2015	2/28/2018
Dishaw	Breitbart	National Science Foundation	2356.32	5/1/2015	4/30/2018
Buck		National Science Foundation	88494.83	2/1/2014	2/28/2017
Buck		National Science Foundation	37986.42	3/1/2014	8/31/2017
Buck		National Science Foundation	24625.76	7/15/2015	6/30/2018
Byrne		National Science Foundation	135876.51	9/15/2012	8/31/2017
Byrne		National Science Foundation	143809.15	8/1/2014	7/31/2017
Byrne		US Geological Survey	33510.11	9/1/2014	8/31/2017
Byrne		Texas A & M University	1470.04	9/1/2015	8/31/2018
Byrne		National Science Foundation	49972.08	1/1/2016	6/30/2016
Byrne		Sunburst Sensors	39999.08	6/13/2016	12/31/2016
Chambers		National Aeronautics & Space Admin	132967.35	8/6/2012	8/5/2017
Chambers		National Aeronautics & Space Admin	72518.78	3/13/2013	3/12/2018

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Chambers		NASA Jet Propulsion Laboratory	54663.22	6/1/2013	5/31/2017
Chambers		US Geological Survey	49914.97	7/16/2015	7/15/2016
Chambers		National Aeronautics & Space Admin	9778.82	2/16/2016	2/15/2020
Daly		National Science Foundation	36928.39	6/1/2011	11/30/2016
Daly		University of Georgia	38610.60	1/1/2016	12/31/2016
Dixon	Naar, Daly	US Geological Survey	20168.45	3/26/2015	3/25/2017
Dixon	Mitchum	US Geological Survey	24924.90	8/1/2012	7/31/2017
Dixon	Mitchum	US Geological Survey	5551955.00	8/1/2012	7/31/2017
Dixon	Naar	US Geological Survey	33171.16	8/1/2014	7/31/2016
Dixon	Naar, Daly	US Geological Survey	14549.17	3/26/2015	3/25/2017
Domack		National Science Foundation	11546.58	1/1/2014	2/28/2017
Domack		National Science Foundation	7887.62	1/1/2014	6/30/2017
Domack		Austalian Research Council	17296.69	6/15/2015	6/14/2017
Domack		National Science Foundation	31226.31	6/15/2016	5/31/2019
Domack		National Science Foundation	12653.21	9/15/2016	9/14/2017
Greely		National Marine Sanctuary Foundation	18618.77	10/1/2014	10/1/2016
Greely		Natl Oceanic & Atmospheric Admin	37713.34	9/1/2015	5/31/2017
Greely		National Marine Sanctuary Foundation	5767.42	7/1/2016	6/30/2017
Hu		Florida State University	11691.56	8/17/2012	2/26/2016
Hu		National Aeronautics & Space Admin	29979.08	7/15/2013	6/30/2016
Hu		National Aeronautics & Space Admin	55707.56	8/5/2013	8/4/2017
Hu		University of Miami	10121.26	10/1/2013	9/30/2016
Hu		Bubbleology Research International	91016.48	8/1/2013	6/30/2016
Hu		National Aeronautics & Space Admin	80695.77	7/8/2014	7/7/2017
Hu		National Aeronautics & Space Admin	161168.54	1/15/2015	1/14/2018
Hu		National Aeronautics & Space Admin	95027.21	8/29/2014	8/28/2016
Hu		Bubbleology Research International	52599.41	7/1/2013	6/30/2016

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Hu		National Aeronautics & Space Admin	123161.86	10/9/2014	10/8/2017
Hu		Nova Southeastern University	34308.37	1/1/2015	12/31/2017
Hu	Romero	Nova Southeastern University	68651.97	1/1/2015	12/31/2017
Hu		National Aeronautics & Space Admin	70958.20	3/1/2015	2/29/2020
Hu		University of Miami	15466.93	10/1/2015	6/30/2017
Hu		Florida Fish and Wildlife Conservation	21229.63	10/1/2015	4/30/2017
Hu		University of Miami	40652.07	1/1/2016	12/31/2018
Hu		NASA	16841.98	9/1/2016	8/31/2017
Dixon,T	Lembke	National Science Foundation	39.98	12/1/2015	11/30/2018
Lembke		Mote Marine Laboratory	6324.84	3/3/2015	8/31/2015
Lembke		Florida Atlantic University	1296.95	7/1/2015	12/31/2016
Lembke		SECOORA	3209.34	6/1/2016	5/31/2017
Kramer	Lembke	US Department of Treasury	2817.09	9/1/2015	2/28/2018
Luther		Greater Tampa Marine Advisory Council	1193.78	4/9/2004	3/6/2017
Luther		University of Maryland	42834.25	6/1/2011	5/31/2017
Luther		Texas A & M Research Foundation	21686.59	6/1/2011	5/31/2017
Luther	Merz	SECOORA	43368.27	6/1/2015	11/30/2016
Luther	Merz	SECOORA	37429.21	6/1/2016	5/31/2017
Luther		Texas A & M Research Foundation	0.00	6/1/2016	5/31/2021
Mitchum		US Geological Survey	815.00	7/15/2012	7/14/2017
Mitchum		NASA Jet Propulsion Laboratory	87286.88	10/1/2013	9/30/2017
Mitchum		US Geological Survey	19678.81	9/13/2013	9/14/2018
Mitchum		University of Colorado	35405.61	3/14/2013	3/13/2017
Muller		Consortium for Ocean Leadership	4865.12	2/3/2012	1/31/2016
Muller		Consortium for Ocean Leadership	10167.95	1/26/2014	1/31/2016
Muller		Florida Fish and Wildlife Conservation	74360.43	6/19/2015	6/30/2018
Muller		Florida Fish and Wildlife Conservation	48525.92	6/19/2015	6/30/2018
Muller		USGS	0.00	8/1/2016	9/14/2017

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Muller-Karger		Roffers Ocean Fishing Forecasting Srvce	377482.88	9/1/2011	8/31/2016
Muller-Karger		Environmental Protection Agency	98016.06	6/1/2012	5/31/2016
Muller-Karger		National Aeronautics & Space Admin	10511.77	9/1/2012	8/31/2016
Muller-Karger		National Science Foundation	183011.27	9/1/2013	8/31/2017
Muller-Karger		NSF	1782.00	9/1/2013	8/31/2017
Muller-Karger		National Science Foundation	486588.11	2/1/2014	7/31/2017
Muller-Karger		Natl Oceanic & Atmospheric Admin	12170.30	8/1/2014	12/31/2016
Muller-Karger		National Aeronautics & Space Admin	69587.82	8/4/2014	5/17/2017
Muller-Karger		National Aeronautics & Space Admin	926330.00	8/18/2014	8/17/2019
Muller-Karger	Breitbart	National Aeronautics & Space Admin	187702.96	8/18/2014	8/17/2019
Muller-Karger		University of Central Florida	6138.29	8/1/2014	5/1/2016
Muller-Karger		Bubbleology Research International	163296.77	10/1/2014	9/30/2017
Muller-Karger		University of Fiji	17020.56	4/15/2015	4/14/2018
Muller-Karger		National Aeronautics & Space Admin	17563.18	9/1/2015	8/31/2017
Muller-Karger		University of Miami	14345.06	9/1/2015	8/31/2017
Muller-Karger		National Aeronautics & Space Admin	15460.79	5/1/2016	4/30/2017
Muller-Karger		Group on Earth Observations	19000.00	7/25/2016	11/30/2016
Muller-Karger		Texas A&M National Science Foundation	19000.00	6/1/2016	5/31/2021
Murawski		Consortium for Ocean Leadership	113563.31	10/1/2013	9/30/2017
Murawski		Consortium for Ocean Leadership	3327414.07	1/1/2015	12/31/2017
Murawski	Ainsworth	Consortium for Ocean Leadership	159993.38	1/1/2015	12/31/2017
Murawski	Daly	Consortium for Ocean Leadership	164406.18	1/1/2015	12/31/2017
Murawski	Gilbert	Consortium for Ocean Leadership	676447.42	1/1/2015	12/31/2017

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Murawski	Greely	Consortium for Ocean Leadership	84855.33	1/1/2015	12/31/2017
Murawski	Hollander	Consortium for Ocean Leadership	663629.76	1/1/2015	12/31/2017
Murawski	Hotaling	Consortium for Ocean Leadership	276054.49	1/1/2015	12/31/2017
Murawski	Hu	Consortium for Ocean Leadership	177886.04	1/1/2015	12/31/2017
Murawski		Consortium for Ocean Leadership	365585.79	1/1/2015	12/31/2017
Murawski	Paul	Consortium for Ocean Leadership	88475.72	1/1/2015	12/31/2017
Murawski	Peebles	Consortium for Ocean Leadership	151828.51	1/1/2015	12/31/2017
Murawski	Walsh	Consortium for Ocean Leadership	157337.63	1/1/2015	12/31/2017
Murawski	Lembke	National Fish and Wildlife Foundation	956087.44	1/1/2015	1/31/2018
Murawski		University of California Florida Atlantic	4993.00	4/1/2015	9/16/2016
Murawski		University	222709.28	7/1/2015	6/30/2016
Murawski		Gulf of Mexico Alliance	2069.99	10/1/2016	6/30/2018
Murawski		NAS	0.00	12/1/2016	11/30/2017
Paul		Gordon and Betty Moore Foundation	11999.63	8/15/2011	3/2/2016
Paul		Natl Oceanic & Atmospheric Admin	67297.00	9/1/2015	8/31/2018
Peebles		University of Miami	173528.48	8/1/2012	11/30/2016
Peebles		University of Miami	158210.32	10/1/2015	9/30/2017
Kramer	Peebles	US Department of Treasury	6682.92	9/1/2015	2/28/2018
Peebles	Breitbart	US Department of Treasury	31453.37	9/1/2015	2/28/2018
Rosenheim		Louisiana State University	8304.51	5/1/2014	1/31/2017
Rosenheim		National Science Foundation	31428.29	7/1/2015	6/30/2018
Rosenheim		National Science Foundation	9273.35	11/1/2015	10/31/2016
Seibel		National Science Foundation	5254.56	12/22/2015	4/30/2017
Seibel		National Science Foundation	15422.00	2/8/2016	7/31/2017
Seibel		University of Rhode Island	0.00	12/1/2016	9/30/2018
Shevenell		National Science Foundation	47609.37	4/1/2013	3/31/2017

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Stallings		Florida State University FL Department Environmental Protection	26910.13	9/1/2011	8/31/2016
Stallings		FL Department Environmental Protection	108304.88	5/30/2014	8/30/2017
Stallings		FL Department Environmental Protection	78682.63	5/30/2014	8/30/2017
Stallings		FL Department Environmental Protection	12232.81	5/30/2014	8/30/2017
Stallings		Florida Fish and Wildlife Conservation	1811.76	1/27/2016	7/31/2018
Stallings		Northeastern University	26558.29	9/1/2016	2/28/2017
Stallings		Florida Fish and Wildlife Conservation	9274.16	2/26/2016	9/30/2016
Weisberg	Hu	NOAA Natl Oceanic & Atmospheric Admin	58715.01	9/1/2015	8/31/2018
Weisberg	Walsh	National Aeronautics & Space Admin	34556.26	9/1/2015	8/31/2018
Weisberg	Weisberg	SECOORA	93711.62	1/10/2013	1/9/2017
Weisberg	Merz	SECOORA	160301.11	6/1/2015	11/30/2016
Weisberg	Liu	SECOORA	135743.03	6/1/2015	11/30/2016
Weisberg	Hu,Lenes,Liu, Walsh, Zheng	Natl Oceanic & Atmospheric Admin	58715.01	9/1/2015	8/31/2018
Weisberg	Merz	SECOORA	14901.83	6/1/2016	5/31/2019
Weisberg	Liu	SECOORA	41023.08	6/1/2016	5/31/2019
Weisberg		Fl Fish Wildlife	2,901.00	10/1/2016	9/30/2017
Weisberg		Pinellas Cty Restore Act/US Treasury	62262.79	11/6/2016	7/31/2018
Weisberg		Pinellas Cty Restore Act/US Treasury	28795.08	1/1/2016	8/31/2018