



**UNIVERSITY OF
SOUTH FLORIDA**
College of MARINE SCIENCE



ANNUAL REPORT

January 1 – December 31, 2020

Submitted by: Dean Thomas K. Frazer

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THE VIEW FROM THE BRIDGE

The View from the Bridge



What a privilege to be at helm of such a fine ship. Previous deans have positioned her well for an extended voyage and I believe that our very capable crew is thirsty for adventure. After more than a year tied up at the dock, I know that I am.

Covid-19 gave us all a really bad case of the shipyard blues, with nary a pub in view. Swab the decks, polish the rails, and mend the nets, it seemed that there might be nothing more to do. But not true -- definitely not for this extremely talented College of Marine Science crew.

In 2020, CMS faculty, staff and students continued to shine. Collectively, the team published **more than 100 peer-reviewed journal articles**, including contributions in prestigious journals such as *Nature*, *Nature Communications*, *Nature Geosciences*, *Geophysical Research Letters*, *Proceedings of the National Academy of Sciences*, *Scientific Reports* and *Science Advances* -- just to name a few.

Here are just a few highlights:

Ten years after the historic *Deepwater Horizon* oil spill that prompted the launch of our international C-IMAGE research effort, Drs. Murawski, Hollander, Ainsworth and C-Image Assistant Director Sherry Gilbert edited a comprehensive two-volume set that synthesized findings related to the fate and effects of the oil spill, and provided recommendations to guide future research, response efforts and policy changes. In total, there were 10 CMS-authored chapters that included renowned scientists from around the globe.

Total research expenditures in FY 2020 exceeded more than \$14.1 M with approximately \$2.3 M in indirect cost recovery -- reflecting extraordinary productivity given that it was orchestrated largely from living rooms, dining areas and makeshift home offices rather than ships, small boats and labs. **More than 20** other scholarly products developed at the CMS are currently in revision or review. Dr. Byrne was issued a U.S. patent for a new way to determine the carbon system parameters of water, and Dr. Merz submitted a patent application for a novel low-cost chitosan-based membrane that can be used to filter water for pesticides, herbicides, and more. Chitosan is a natural biopolymer found in the shells of marine animals such as shrimp, crabs, and lobsters.

THE VIEW FROM THE BRIDGE

As an academic family, we all owe a special debt of gratitude to Dr. Mitchum for his leadership and effective messaging during a time of extreme angst and uncertainty. He worked tirelessly with faculty, students and staff to ensure that essential work could be completed without compromising the health and safety of any individual.

Dr. Naar and Sami Francis also deserve a special shout out for their tireless efforts to ensure student success during this past year. David and Sami function much like a Leia and Luke tandem at the College of Marine Science – relentlessly shining their light to improve processes and morale during tough times while fighting off any dark forces of confusion or isolation. Sami doesn't just do her job, she serves her community. One student struggling with grief this year said Sami called her up every two weeks to check in and provide a “non-judgmental, safe voice of reason” – making all the difference in this student's ability to succeed. When the pandemic hit, Dr. Naar also went beyond the call of duty – providing information and support around the clock. When the visa status of international students was uncertain, for example, he worked diligently with USF administration to find a solution while keeping the college community informed every step of the way.

With this narrative as a backdrop, it is worth noting that **15 graduate degrees were conferred** in 2020, including six PhDs and nine master's degrees. Our graduate students have followed the lead of our accomplished faculty and continue to impress. Collectively, students contributed this past year to **16 peer-reviewed publications, including nine as first author**. In spite of travel restrictions and reduced opportunities for dissemination of research findings, CMS students delivered dozens of presentations to national and international audiences, both in person and virtually. They didn't stop there. In 2020, **students garnered more than \$300,000 of external funding and were recipients of numerous accolades that included more than 65 scholarships and fellowships**.

The level of service and community engagement exhibited by our students is extraordinary. It speaks to their understanding of, and appreciation for, activities that yield value well beyond the confines of our campus here in St. Petersburg. To that point, I am especially heartened to see the level of interest in and commitment to tackling broader societal issues of social justice and human rights, particularly those related to racism and discrimination. We all have a role to play in addressing the inequities that pervade society and I am proud of the actionable steps we are taking at the College of Marine Science to ensure greater diversity, equity and inclusion. We have, in fact, established a new standing committee specifically for that purpose due, in large part, to the unified voice of our students, staff and faculty imploring us to lead by example. We will do that! It is especially important as we endeavor to establish ourselves as a premier marine science program nationally that we continue to place a premium on excellence in all facets of our work. In so doing, it is imperative that we seek diversity not only in our science, but in perspectives and participation.

I would be remiss in my duties as Dean if I failed to acknowledge the **exemplary level of support provided by staff** in the college. Hard stop. By all accounts, they were overachievers pre-Covid. Accomplishments during this pandemic simply catapulted the staff to super hero status. I continue to be impressed by the work ethic, high level of service and professionalism exhibited by our fiscal, HR,

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communications and development teams. It is possible, based on my interactions, that the term “Can do attitude” was coined here at CMS. I thank them all.

With regard to staff, we celebrated Tony Greco’s 40 years of service this past year and wish him all the best in retirement. Tony was, and continues to be, a pillar of our community. He will be greatly missed.

The untimely passing of Dr. David Hollander underscored the darkness that was 2020, while at the same time reminding us of all that is good. Thanks, David, not only for the memories, but for the inspiration to move forward. Always with a smile, just as you did.

We bid farewell to the year that was and look forward to setting sail into 2021.

College of Marine Science Leadership Team

THOMAS K. FRAZER

Dean, College of Marine Science

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Dr. Thomas Frazer is a Professor and Dean of the College of Marine Science at the University of South Florida. Prior to his arrival at USF, Dr. Frazer was Director of the School of Natural Resources and Environment at the University of Florida and served also as Chief Science Officer for the State of Florida. Dr. Frazer holds a Bachelor's Degree in Fisheries Biology from Humboldt State University and a Master's Degree in Fisheries and Aquatic Sciences from the University of Florida. He earned his Ph.D. in Biological Sciences from the University of California, Santa Barbara. His research addresses contemporary and emerging environmental issues, and is, by nature, interdisciplinary. His work involves collaborators from disparate disciplines, and it includes sampling and experiments conducted across a wide range of spatial and temporal scales. Dr. Frazer has received research funding from a broad suite of granting entities to address topics pertaining to water quantity and quality, nutrient dynamics, biogeochemical processes, fish population dynamics, food web interactions, and ecological restoration of degraded ecosystems. He has conducted field research in both freshwater and marine systems around the globe, and he is intimately familiar with a broad suite of environmental and natural resource issues (e.g., eutrophication of fresh, estuarine, and coastal waters; invasive species; and the ecological impacts of contemporary environmental change, including coral bleaching, ocean acidification, and sea level rise). Dr. Frazer has authored and/or co-authored more than 175 peer-reviewed publications, technical reports, and book chapters. Dr. Frazer currently serves as Chair of the Gulf of Mexico Fisheries Management Council. He is also a member of APLU's Board on Oceans, Atmosphere and Climate, and he previously served as member of the US EPA's Oil Spill Research Strategy Review Panel.

GARY MITCHUM

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Dr. Mitchum is the Associate Dean and Professor of Physical Oceanography. After receiving his PhD 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,

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physical controls on fisheries variables, and storminess changes in the southeastern United States. 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. Mitchum serves on numerous local, national, and international committees, most notably he serves as Chair of the Global Sea Level Observing System (GLOSS) Group of Experts and is President of the IUGG/IAPSO Commission on Mean Sea Level and Tides.

DAVID NAAR

Associate Dean of Academic Affairs, College of Marine Science

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Dr. Naar is the Associate Dean of Academic Affairs and Professor in Geological Oceanography. He has overseen the graduate academic program and graduate student matters since 2012. He received his bachelor's degree in Geology with an emphasis in Geophysics from University of California, Santa Barbara in 1982, and his PhD in Earth Sciences from Scripps Institution of Oceanography, at the University of California, San Diego in 1990. Dr. Naar started as an assistant professor at the University of South Florida's Department/College of Marine Science in 1990. In 1996, he became an associate professor at USF and subsequently the co-director of the Center of Coastal Ocean Mapping at USF. His research interests are on microplate tectonics, propagating rifts, 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 several panels and working groups for the National Science Foundation, Ocean Observatory Initiative, and Ocean Drilling programs, and on the United States Scientific Advisory Committee.

MONICA DUFAULT

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Ms. Monica Dufault Leake is the Budget Director for the College of Marine Science. She received her Master's degrees in Research Administration and Nonprofit Management from the University of Central Florida. She began her career in higher education and research administration at the University of Central Florida from 2000-2007 before relocating to Baltimore to work at Johns Hopkins University from 2007-2011. Dufault returned to Florida in 2011 to join the College of Marine Science as the Manager of Business and Fiscal Administration.

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TIM TROWBRIDGE

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Mr. 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, Trowbridge was promoted to Unit HR Administrator 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 Project Manager, College of Marine Science

MS, University of South Florida, 1986

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Mr. Donnelly is the Facilities Project Manager for the College of Marine Science. 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. Donnelly currently serves on several CMS committees (Space, Safety, and Computer) and is also a member of the USFSP campus EMT, which deals with all matters relating to the USFSP Campus Emergency Management Plan (CEMP).

KRISTEN KUSEK

Director of Strategic Communications

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Ms. Kusek has operated as our Director of Strategic Communications since 2018. Her primary job is to lead the communications strategy for the College, as well as the tactical execution of that strategy. She serves as the brand guardian and chief storyteller for the College, and is responsible for print and/or digital news, collaborating with USF's other news professionals on media outreach, and for supporting outreach, strategic fundraising, and community engagement initiatives. She is also spearheading the newest education outreach STEAM program in the CMS portfolio, a partnership with Boys & Girls Clubs of the Suncoast that is focused on coastal resiliency called Guardians of the Gulf. The first to earn dual master's degrees in marine science and journalism/mass communications from USF, Kusek brings to her cross-functional role

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more than 22 years of experience working on all sides of the science communications landscape. Her passion is developing cross-functional programs that leverage the power of storytelling to inspire, educate, and empower. Before boomeranging back to USF, she served as Chief Communications and Development Officer for the Boston-based global nonprofit Earthwatch Institute, where her team raised more than \$4 million annually while implementing creative education and marketing campaigns that increased expedition engagement year over year. Career highlights include reporting “live” from expeditions in the South Pacific and the Arctic, spearheading Earthwatch’s first virtual reality experience, leading Harvard’s Wyss Institute for Biologically Inspired Engineering in its communication strategy, serving as creative education director in an NSF-funded IMAX film “Volcanoes of the Deep Sea,” and founding a Science Journalism Center at USF.

LAURIE SCOTT

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Ms. Laurie Scott joined the College of Marine Science as director of development in July 2019. Prior to this, she worked for the Baker Institute for Public Policy, a think tank at Rice University in Houston, TX. She holds an MA degree in Political Science from the University of Nebraska-Lincoln. Laurie has spent her entire career working in development both in the education sector, as well as for large non-profits in New Zealand and the U.S. focused on human services and the environment. In collaboration with the Dean and the Associate VP of Development, she is responsible for promoting and enhancing public awareness about the college and fostering an exchange of information, talents and private support (fund-raising) for advancing its mission from various constituency groups including alumni, parents, friends, students, current and former faculty, corporations and foundations.

RENATE JURDEN

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Ms. Renate Jurden is the Executive Administrative Specialist to the Dean of the College of Marine Science. She received her M.Ed. from Plymouth State University. She worked at the University of New Hampshire prior to moving to Florida and joining the College of Marine Science in April 2019. Renate is the first point of contact for the Dean’s office. She manages the Dean’s calendar, organizes meetings and events for the college, oversees the college’s foundation accounts, and acts as a liaison with other colleges, and collaborators in federal and state agencies. She is the central resource person for information, referral, and assistance.

Graduate Program

ACADEMIC PROGRAMS

The year 2020, provided many challenges, especially in the spring, when faculty, staff, and students all had to adjust to a new One-USF consolidation requirement by July 1, 2020, while adjusting to the changes resulting from the COVID-19 pandemic outbreak in early spring 2020. Classes that were being taught in person, face to face, were modified in order to have students and faculty stay at home. Most courses were taught synchronously via remote platforms such as MS Teams, Canvas Collaborate, and other modes. Some courses already being taught asynchronously continued without interruption, such courses, became quite popular, such as the online version of OCE 2001, Introduction to Oceanography, in which enrollment for Summer and Fall 2020 increased dramatically. Progress on submitting a proposal for a non-thesis Master of Arts in Marine Studies, with concentrations in Business, Journalism, Engineering, etc., was put on hold during the pandemic and during discussions regarding a newly restructured College. Once the College structure plans are completed, this proposal will be revised as needed and submitted. A newly funded USF-NOAA Center in the fall of 2020, called the Center for Mapping and Innovative Technologies (COMIT), has proposed a hydrographic concentration or degree program that would meet Category A or B Accreditation from the International Hydrographic Organization. Research on developing such curricular was started and continuing into 2021.

STUDENT AFFAIRS

Recruitment occurred in person in early 2020, and despite the changes that occurred a few weeks later because of the pandemic, the College had another strong year for enrollment for Fall 2020. Some graduate students starting in Fall 2020 who had just graduated in Spring 2020, had some experience with remote-learning and were able to adapt quickly. Others had more of a challenge, but the Faculty and Teaching Assistants made efforts to reach out to the new students and provide additional assistance. Online student evaluations for the courses taught in 2020 remained strong (as compared to years past), despite the challenges resulting from change of course delivery methods.

DIVERSITY

The year 2020 was a difficult year for many in the college who witnessed the news media video of the horrific murder of George Floyd, to name only one of many brutal attacks against African-Americans and other groups of color throughout 2020 and before. Racial hate crimes towards Asian-Americans was also reported following misinformation regarding the COVID-19 pandemic. These atrocities and many others led to the USF Principles of Community (<https://www.usf.edu/president/principles-of-community/index.aspx>), which focuses on systemic racism and anti-racist solutions to provide a safe, respectful, professional, and inclusive working environment where everyone is treated equally, fairly, and with justice. Over the summer and the rest of the Fall 2020, the *Diversi-teas* virtual meetings focused on specific topics related to historical and systemic racism, open to all faculty, staff, and students. Following the best practices of the Alfred P. Sloan program, in which the College of Marine

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Science was a USF Affiliate Member of the University Center of Excellence in Mentoring, the College has continued its interactions with the College of Engineering, developed or continued some of its own programs, such as the Graduate Exemplary Mentoring, and the aforementioned *Diversi-teas*, and began discussions on forming a Diversity, Equity, and Inclusion committee as a standing committee in the College Governance structure reporting to the Dean's Advisory Council. This activity continued and the committee was officially adopted into the College Governance document during the Spring 2021 semester. Five out of the 19 (~26%) students admitted to the Fall of 2021 will be of underrepresented minority status as defined by the National Science Foundation, which reflect both the program's diverse recruitment efforts and holistic evaluation of applicants for admittance to the graduate program in 2020.

GRADUATE PROGRAM HIGHLIGHTS FROM 2020

New Students

10 students entered the PhD program

8 students entered the MS program

Degrees Conferred

6 PhD

9 MS

Orientation Activities for New Students

- Twenty students participated in a virtual *New Student Orientation* over a four-day period. Each student received a one-on-one welcome meeting with the Assistant Director of Academic Affairs to review the graduate handbook, funding, and the student's individual plan of study.
- *Summer Pre-Orientation* meetings gave students a chance to interact and learn about the CMS community in the weeks leading up to the week of *New Student Orientation*. This included the following:
 - o *Drop-in Hours* for the Office of Academic Affairs, which was provided three times over the summer to new and existing students. Questions ranged from new student funding, finding housing, and other graduate program questions.
 - o *How to Burg It: Life in St. Petersburg*, which was a panel discussion with students, faculty, and staff.
 - o *Fostering Mentor/Mentee Relationships*, which was provided twice by Dr. Pam Hallock Muller.
 - o *Opportunities for Student Involvement*, which was a panel discussion regarding college and educational outreach activities.

New students were also invited to attend regular Virtual Summer Meetings, such as *Diversi-teas* run by Dr. Ana Arellano and other meetings such as the monthly *Lunch with the Dean*.

New Shadow and Mentorship Programs

Over the summer, new students were paired with current students in their discipline as peer mentors to enable them to ask questions related to housing and preparing to do classwork, research, etc. As

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part of assisting underrepresented minorities in the Bridge to the Doctorate and the Alfred P. Sloan University Center for Exemplary Mentoring programs, the Multi-Dimensional Mentoring model was introduced to them. They were assigned mentors from different levels, such as peer mentor, graduated mentor, and faculty mentor, which would assist the Major Professor in advising and mentoring the student to succeed in the program.

Student Workshops provided to students, staff, and faculty:

- CV and Resume Workshop with Dr. Kiri Kilpatrick in collaboration with Office of Graduate Studies
- Self-Care During COVID with the Wellness Center, St Petersburg Campus
- Diversity Training with the Office of Multicultural Affairs, St Petersburg Campus
- Multi-Dimensional Mentoring & Summer Peer Mentors program
- Student Seminar Speaker Meetings
- Dean's Lunches
- Toasts to Graduating Students (in spring, summer, and fall in 2020).
- *Diversi-teas* community discussions & Systemic Racism discussion series

Professional Development within the Classroom

Several classes have increased writing and presentation in-class activities to further develop the graduate student communication skills. Further the program offers a course in Scientific Writing by Professor Pamela Hallock Muller and courses in Professional Development (I & II) by Professors Mya Breitbart and Kristen Buck. Since starting the course in 2021, Marine Science graduate students have received 10 NSF Graduate Research Fellowships between 2012 and 2020 (35% of the 28 NSF GRFP awards obtained by USF students during this period) and 7 NSF GRFP Honorable Mentions (23% of USF's 31 Honorable Mentions).

Outreach Opportunities and Programs provided by CMS Personnel:

- Learning from our past: Understanding Earth's Climate History and Future, American Museum of Natural History, Climate Week NYC, New York City (Invited-Virtual), 23 September, 2020; (<https://www.facebook.com/naturalhistory/videos/400078257642223>) with over 12,000 views). (Shevenell)
- Real Time Ocean Observations for Maritime Transportation: Novel Applications. Virtual presentation for St. Petersburg Innovation District State of Science, 10/13/20. (Luther)
- Real Time Ocean Observations for Maritime Transportation: Tampa Bay Physical Oceanographic Real-Time System. Virtual presentation for the Sunrise Rotary Club, 12/1/20. (Luther)
- Precision Navigation for Maritime Transportation: Research at the USF College of Marine Science. Virtual presentation for the Cruising Club of America, 12/10/20. (Luther)
- Development of Marine Science exhibits for the St. Petersburg Pier Discovery Center in collaboration with the Pier Aquarium, Inc., Marine Exploration Center (MEC), and Tampa Bay Watch. (Luther)
- EPA/USACE/NOAA Public Hearing for the Kampachi Fish Farms, LLC at Mote Marine Lab in Sarasota, FL. (Weisberg)

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- Invited Red Tide Seminar at St. Petersburg Yacht Club (Weisberg)
- Invited Webinar for the Charlotte Harbor National Estuary Program (Weisberg)
- Invited webinar to the coastal ocean community organized by SECOORA (Weisberg)
- Media interviews, Pro bono consulting, Daily and Realtime metrological and oceanographic posts regarding weather, nowcast/forecast current models, Red Tide forecasts (<http://comps.marine.usf.edu> <http://ocgweb.marine.usf.edu/> <http://ocgweb.marine.usf.edu/~tbm/index.html> http://ocgweb.marine.usf.edu/hab_tracking/) (Weisberg's Lab)
- Chairing the Board of Trustees for a not-for-profit skilled nursing/assisted living facility (Weisberg)
- Scientific Committee of the 3rd Conference of the Arabian Journal of Geosciences (CAJG), held online, on 2–5 November 2020 (edited abstracts and short papers for scientists with limited English writing skills) (Hallock Muller)
- Developed website for media inquiries about the impacts of DWH 10 years later:
- (<https://www.marine.usf.edu/c-image/ten-year-anniversary/>) (Murawski, Gilbert, et al.): Website includes publicly accessible:
 - a) Summary video produced by USF Marketing and Communications
 - b) 10-year anniversary booklet
 - c) Podcast: Review of Ten-years of C-IMAGE (Murawski, Romero, & other C-IMAGE members)
- Summary paper in the Conversation: (<https://theconversation.com/scientists-have-found-oil-from-the-deepwater-horizon-blowout-in-fishes-livers-and-on-the-deep-ocean-floor>) (Murawski and Gilbert)
- Major synthesis paper on “A First Comprehensive Baseline of Hydrocarbon Pollution in Gulf of Mexico Fishes. (This article was one of the top 100 most downloaded articles of 2020!! (Pulster et al.)
- FOX 13 Interview on Deepwater Horizon. (Murawski) (https://www.fox13news.com/video/675669?fbclid=IwAR3tMeyVC_aYpYpVKcFt-iYTVuVmZ-MOL-vVRwnrp1QQdIt9ikULvx0OfEw)
- CMS Graduate student, Madison Schwaab, highlighted as GoMRI Scholar: (<https://gulfresearchinitiative.org/grad-student-schwaab-investigates-how-tuna-and-billfish-respond-to-oil>)
- Florida Matters: <https://wusfnews.wusf.usf.edu/show/florida-matters/2020-04-20/10-years-after-gulf-oil-spill-environmental-effects-linger> (Murawski)
- Ten-year anniversary piece in Tampa Bay Times (Murawski, Gilbert, and Hollander) (<https://www.tampabay.com/opinion/2020/04/17/lessons-of-the-deepwater-horizon-disaster-10-years-later-column/>)
- Opinion Piece sustainable fisheries (Madison Schwaab) (<https://www.tampabay.com/opinion/2020/04/26/how-to-make-fish-farming-environmentally-friendly-sustainable-and-successful-column/>)
- Interview with Julie Rose, host of “Top of Mind” on Sirius XM Radio (May 12, 2020) (Murawski)

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- Premiere of PBS produced “Changing Seas” with panel discussion ([Murawski](#)) (<https://ovee.itvs.org/screenings/eaw92>)
- Interview about the Mauritius spill (Murawski and Hollander) (<https://iloveanimalia.com/blogs/animalia-podcast/mauritiusoilspill>)
- Additional virtual educational outreach activities occurred in 2020 run by many faculty, staff, and students throughout the college, but were not recorded.

Research or Outreach activities for K-12 students, their teachers, or undergraduates

- Clam Bayou Comps Tours: ~ 40 undergraduates (Luther, Scudder, Ivey – USF SP Campus, and Wakely, SECOORA).
- Clam Bayou Coastal Field Trips & Professional Development: ~55 undergraduates, ~32 K-12 teachers (Greely)
- Guest Lectures for the USF SP Campus undergraduate Environmental Science and policy Classes. (Luther)
- Mentoring three USF Environmental Science Undergraduate Interns. (Luther)
- Mentoring undergraduate in the Ocean Circulation Lab (Law)
- NOAA Ocean Exploration & Research Educator Professional Development (32 middle and high school Florida teachers statewide)
- Spoonbill Regional Ocean Science Bowl / National Ocean Science Bowl (90 high school students & 20 teachers; 30 CMS volunteers & 30 FWC, USGS, NOAA, Eckerd College, New College)
- Oceanography Camp for Girls (28 teen girls and 10 OCG alum teens as peer counselors)
- Some other activities from 2019 were not renewed in 2020 because of the pandemic, but are anticipated to restart once the constraints from the pandemic are lifted.

Undergraduate Teaching by Marine Science faculty and Adjuncts (11 sections, 5 courses, and 287 total enrolled)

Introduction to Oceanography - Tampa campus (Greely)

Introduction to Oceanography - Online (Arellano)

Geological History of Florida - Online (Arellano)

Marine Aquaculture - Online (Main)

Port Sustainability - Online (Luther)

Experiential Learning in Marine Science –St. Pete campus (Greely)

Student Publications

16 publications by 13 students

9 first-authored by students

Student Presentations

- 25 Presentations by students: 17 domestic, 6 virtual, and 2 international
- Students in CMS’ Marine Resource Assessment Program were instrumental in hosting, organizing, and running the EcoPath 35 Conference hosted with FWRI in St. Petersburg, FL, December 2019

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- PhD student Laura Azevedo served as Conference Director for the Underwater Mining Conference in September 2020. Originally scheduled to be hosted in St. Petersburg, FL, the UMC successfully pivoted to virtual delivery.

Graduate Student Symposium Results

Brigid Carr, MS	GSS Research w/ Results 1st Place
Jonathan Peake, PhD	GSS Research w/ Results 2nd Place
Madison Schwaab, MS	GSS Research w/ Results 3rd Place
Alexander Timpe, PhD	GSS Proposed Research 1st Place
Christina Welsh, MS	GSS Proposed Research 2nd Place (tie)
Laura Azevedo, PhD	GSS Proposed Research 2nd Place (tie)

DEGREES OFFERED

The following certificate and degrees are offered at the College of Marine Science:

Graduate Certificate in Teaching & Communication Ocean Sciences Broader Impacts

Master of Science (M.S.) and Doctoral (Ph.D.) degrees in Biological, Chemical, Geological, Marine Resource Assessment (MRA), and Physical Oceanography Concentrations

STUDENTS GRADUATED IN 2020

Doctoral (6)

Deak, Kristina, advised by Steven Murawski, summer, *Polychlorinated Biphenyls, Organochlorine Pesticides, and Polycyclic Aromatic Hydrocarbons in Snapper (Family Lutjanidae) from Cuba and the Wider Gulf of Mexico*

Mellett, Travis, advised by Kristen Buck, summer, *Development of a benthic foraminifera based Marine Biotic Index (Foram-AMBI) for the Gulf of Mexico: a decision support tool*

Sharp, Jonathan, advised by Robert Byrne, fall, *Analytical Methods and Critical Analyses Supporting Thermodynamically Consistent Characterizations of the Marine CO₂ System*

Snyder, Susan, advised by Steven Murawski, spring, *Polycyclic Aromatic Hydrocarbon Exposure, Hepatic Accumulation, and Health Impacts in Gulf of Mexico Tilefish*

Vasbinder, Kelly, advised by Cameron Ainsworth, fall, *Modeling Early Life: Ontogenetic Growth and Behavior Affects Population Connectivity in Gulf of Mexico Marine Fish*

Vecchio, Julie, advised by Ernst Peebles, spring, *Isotope-based methods for evaluating fish trophic geographies*

Master's (9)

Ayala, Oscar, advised by Chris Stallings, spring, *Efficacy of Recompression Tools to Reduce the Discard Mortality of Reef Fishes in the Gulf of Mexico*

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Carr, Brigid, advised by Steven Murawski, summer, *Investigating the Isotope Signatures of Dissolved Iron in the Southern Atlantic Ocean*

Nguyen, Bich Vi Viviane, advised by Ernst Peebles, spring, *Investigation of retention versus export of planktonic fish eggs in the northeastern Gulf of Mexico*

O'Malley, Bryan, advised by David Hollander, summer, *A health assessment of Gulf of Mexico Golden Tilefish (*Lopholatilus chamaeleonticeps*) and Red Snapper (*Lutjanus campechanus*) following the Deepwater Horizon oil spill*

Prunella, Catherine, advised by Amelia Shevenell, fall, *Plio-Pleistocene Antarctic ice-ocean interactions in the Ross Sea*

Schafer, Carolyn, advised by Brad Rosenheim, spring, *Mechanisms of Carbon Movement and Stabilization in Mangrove Wetlands*

Schwaab, Madison, advised by Steven Murawski, fall, *Polycyclic Aromatic Hydrocarbons in Pelagic Fishes of the Gulf of Mexico*

Shedler, Sarah, advised by Brad Seibel and Hechter Judkins, spring, *Large Thecosome Pteropods of the Northern Gulf of Mexico: Species Abundance, Spatial and Vertical Distribution with a Temporal Comparison of Shell Thickness*

Summers, Brent, advised by Tim Conway, summer, *A process-based approach to evaluating the role of organic ligands in trace metal cycling in the marine environment*

STUDENT HONORS, AWARDS, AND ACHIEVEMENTS

In 2020, there were 22 new external awards and one honorable mention. Of these, eight are multi-year awards providing \$234,000 in support this year. **Combined with one-time awards, the students brought in \$313,050 of external funding to the College of Marine Science.** Many of the federal awards and the McKnight Fellowships also come with extra funds to cover tuition and health insurance covered, but those amounts are not shown in the award amounts totaled above or listed below

2020 STUDENT AWARDS OR HONORS FROM OUTSIDE OF CMS

Imogen Browne: The Oceanography Society International Conference on Paleooceanography Student Travel Award, \$1,400

Jessica Caggiano: 2020 NASA Earth Science FINESST Future Investigator for project 19-EARTH20-0209, Understanding Surface Wave Signals in SWOT Altimetry (Year 1 of 3-year award totaling \$128,000), \$43,000

Cara Estes: Gulf of Mexico Coastal Ocean Observing System (GCOOS) Fellowship, \$6,000

Michelle Guitard: US Science Support Program Post-Expedition Activity award for IODP Exp. 382, \$18,000

GRADUATE PROGRAM

Savannah Hartman: Florida Education Fund McKnight Doctoral Fellowship (Year 4 of 5-year award totaling \$36,000), \$12,000

Hannah Hunt: USF University Graduate Fellowship, \$18,000

Alex Ilich: Southern Association of Marine Laboratories Student Travel Award, \$350

Luis D. Lizcano-Sandoval: Fulbright-Colciencias (recurring), \$29,000

Naja Murphy: Florida Education Fund McKnight Doctoral Fellowship (Year 1 of 5-year award totaling \$36,000), \$12,000

Delfina Navarro-Estrada: USF Graduate Student Success Fellowship (Year 2 of 3-year award totaling \$36,000), \$18,000

Delfina Navarro-Estrada: National Science Foundation Graduate Research Fellowship 2020 Fellow (Three-year total, \$128,000), \$46,000

Martina Plafcan: Fish Florida! Scholarship, \$8,000

Martina Plafcan: Friends of Gumbo Limbo Nature Center Gumbo Limbo Research Grant, \$2,500

Natalie Sawaya: WLP Dorothy L. Morgan Endowed Scholarship in Marine Science, \$2,000

Madison Schwaab: Southern Association of Marine Laboratories Travel Award, \$300

Rebecca Scott: Kaye Pearson Memorial Scholarship, \$10,000

Jing Shi: USF Presidential Fellowship (Year 2 of 5-year award totaling \$160,000), \$32,000

Kara Vadman: Fall 2020 USF Dissertation Completion Fellowship , \$8,000

Kelly Vasbinder: Fish Florida! Scholarship, \$2,000

Christina Welsh: Suncoast Fly Fishers Scholarship, \$500

Christina Welsh: Fly Fishers International Conservation Scholarship, \$2000

Yingjun Zhang: 2019 NASA Earth Science FINESST Future Investigator for project 19-EARTH19-0277: Sub-Mesoscale Eddies Derived from Novel Ocean Color Imagery and ICESat Missions in Support of the SWOT Mission (Year 2 of 3-year award totaling \$126,000), \$42,000

2020 CMS STUDENT FELLOWSHIPS AND AWARDS WITHIN CMS (\$657,000 distributed)

\$80,000 dedicated to funding underrepresented minority students. \$88,000 provided through the Marine Recourse Assessment Fellowship. \$122,000 in Knight Fellowship renewals.

Alyssa Marie Andres: Jack and Katharine Ann Lake Fellowship in Marine Science, \$13,000

Laura Carvalho Britto C. Azevedo: Tampa Bay Parrot Head Fellowship in Marine Science, \$10,000

GRADUATE PROGRAM

Imogen Browne (2017, renewed): William and Elsie Knight Endowed Fellowship Fund for Marine Science (2017, renewed), \$28,000

Imogen Browne: Invited Guest Speaker for Mid-Florida Fulbright Chapter Online Seminar, May 2021

Zach Bunnell: Paul Getting Endowed Memorial Fellowship in Marine Science, \$13,000

Alexandra Burns: Southern Kingfish Association's Fellowship, \$10,000

Emily Chancellor Marine Resource Assessment (MRA) Fellowship, \$8,000

Jing Chen: Gulf Oceanographic Charitable Trust Fellowships Endowment, \$12,000

April Ellis Bridge-to-Doctorate Match Fellowship, \$32,000

Natalia Figueroa-Lopez Bridge-to-Doctorate Match Fellowship (Renewed Year 3), \$24,000

Kalla Fleger: Gulf Oceanographic Charitable Trust Fellowships Endowment, \$12,000

Savannah Hartman: Oceanography Camp for Girls Fellowship, \$5,000

Ellie Hudson-Heck: Carl Riggs Fellowship in Marine Science, \$10,000

Alexander Ilich (2017, renewed): William and Elsie Knight Endowed Fellowship Fund for Marine Science (2017, renewed), \$28,000

Emily Kaiser: Von Rosenstiel Endowed Fellowship, \$26,000

Theresa King: George Lorton Fellowship in Marine Science, \$10,000

Luis D. Lizcano-Sandoval: Norman Blake Endowed Memorial Fellowship in Marine Science, \$10,000

Loraine Martell-Bonet: Bernstein Outstanding Authorship Award, \$1000

Brianna Michaud: Marine Resource Assessment (MRA) Fellowship, \$24,000

Juan C. Millan-Otoya: Young Fellowship Program Fund, \$13,000

Naja Murphy Bridge-to-Doctorate Endowed Fellowship, \$14,000

Mark Mussett: Thomas E. Pyle Memorial Fellowship in Marine Science, \$10,000

Alexander K. Nickerson: Sanibel-Captiva Shell Club / Mary & Al Bridell Memorial Fellowship, \$10,000

Claire Onak: Von Rosenstiel Endowed Fellowship, \$26,000

Jonathan Peake: St. Petersburg Downtown Partnership Fellowship in Coastal Science, \$15,000

Martina Plafcan: Linton Tibbetts Endowed Graduate Student Fellowship, \$10,000

Catalina Rubiano Bridge-to-Doctorate Endowed Fellowship, \$26,000

Kylee Rullo: Von Rosenstiel Endowed Fellowship, \$26,000

GRADUATE PROGRAM

Natalie A. Sawaya: William and Elsie Knight Endowed Fellowship Fund for Marine Science, \$28,000

Katelyn Schockman: William and Elsie Knight Endowed Fellowship Fund for Marine Science (2019, renewed), \$28,000

Kaitlyn Schockman: Invited Presentation, *Schockman, K. Byrne, R.H., Accuracy of CO₂ System Calculations Improved with New Spectrophotometric K₂ Model for Seawater, Ocean Carbonate Intercomparison Forum (OCSIF) Year Two Meeting, Virtual (Online).*

Orion Schomber: Von Rosenstiel Endowed Fellowship, \$26,000

Martina Plafcan: NSF Graduate Research Fellowship, Honorable Mention

Michael J. Schram: William T. Hogarth Fellowship in Marine Mammals *Honorable Mention*

Michael J. Schram: Marine Resource Assessment (MRA) Fellowship, \$24,000

Maddie Schwaab: Marine Resource Assessment (MRA) Fellowship, \$8,000

Rebecca Scott: Marine Resource Assessment (MRA) Fellowship, \$24,000

Jonathan Sharp (2016, renewed): William and Elsie Knight Endowed Fellowship Fund for Marine Science (2016, renewed), \$28,000

Alexander W. Timpe: Garrels Memorial Fellowship in Marine Science, \$15,000

Jessica Van Vaerenbergh: Marine Resource Assessment (MRA) Fellowship, \$24,000

Kelly Vasbinder: William and Elsie Knight Endowed Fellowship Fund for Marine Science, \$28,000

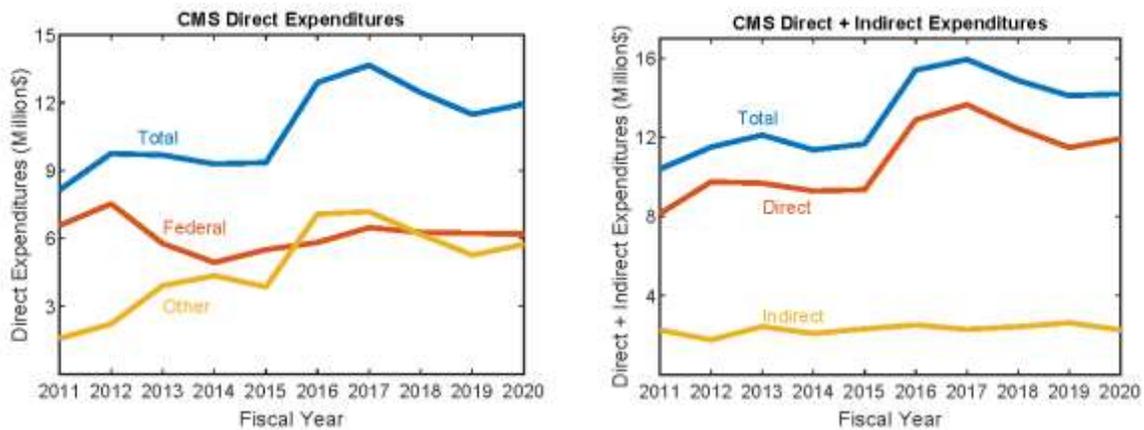
Christina J. Welsh: William T. Hogarth Fellowship in Marine Mammals, \$10,000

Yao Yao: Wells Fargo Fellowship in Marine Science, \$10,000

CMS Research

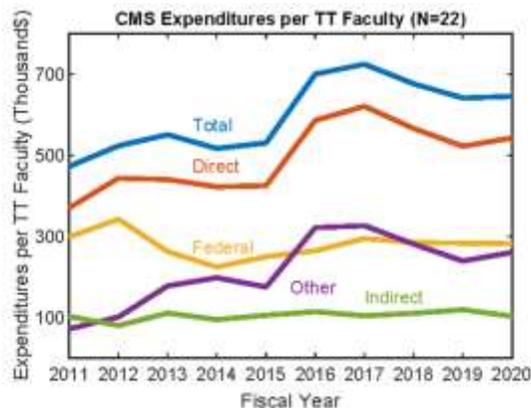
EXCELLENCE IN RESEARCH

Our total research expenditures for fiscal year 2020 stayed stable at ~\$14.1 M, with ~\$11.9 M in direct research expenditures and ~\$2.3 M in indirect cost recovery even though the last half of this fiscal year was impacted by curtailed field activities and expenditures during the COVID pandemic. A larger impact was seen in the second half of calendar year 2020, which will be seen in the fiscal year 2021 report.



ANNUAL RESEARCH EXPENDITURES PER FACULTY

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 the total research expenditures per full-time equivalent tenure-earning faculty member remains stable between \$600,000 and \$700,000.



Highlighted Research

EXPLORING THE SEA FLOOR AND OCEAN COLUMN IN FRONT OF ANTARCTICA'S 'DOOMSDAY GLACIER' WITH AN ORANGE SUBMARINE'

Collapse of the colossal Thwaites Glacier could lead to substantial sea level rise worldwide, but finding out how and when this might happen requires an understanding of its past behavior and present-day forcing.



Photo 1, Caption: The northern edge of Thwaites Glacier's ice tongue which is undergoing dramatic changes. Working together, two interdisciplinary research teams recently deployed an autonomous underwater vehicle (AUV) at the ice edge from the Nathaniel B Palmer, shown here, to investigate the history of the glacier and to understand how the ocean is influencing its behavior. Credit: Alexandra Mazur, University of Gothenburg.

As our understanding of the Antarctic continent has improved, we have come to realize that certain parts of it are more susceptible to unstable behavior than others. Large fast-flowing glaciers, in particular, whose bases are bathed by relatively warm layers of the circumpolar ocean, and which rest on beds that slope landward towards the ice sheet interior are the cause for most concern. These conditions dispose glaciers to a potential runaway retreat aided by ocean melting. Thwaites Glacier in West Antarctica ticks all the boxes for such an 'unstable' configuration. Covering an area $\sim 70,000$ km², Thwaites is the size of Florida and is important to the state's own future – the glacier holds back enough continental ice to raise sea level by more than a meter.

Over two consecutive Antarctic field seasons in 2019 and 2020, Dr. Alastair Graham of the College of Marine Science set sail for the Amundsen Sea embayment, West Antarctica, aboard the US Antarctic Program ice-breaker R.V. *Nathaniel B. Palmer*. The voyages were field components of the NSF-funded

HIGHLIGHTED RESEARCH

Thwaites Offshore Research (THOR) project. Its overall aim: to use the geological record of the sea floor at Thwaites to reconstruct past changes in the state of the glacier, and to show how the glacier has responded to forcing by the atmosphere and ocean through past centuries and millennia.

At any glacier foreland around the world, evidence can be found for the past extent and processes in operation from the shape and composition of the land leading away from the ice front. At Thwaites, Graham anticipated that such a record would also exist near to the ice margin. Accessing this landscape, however, poses significant challenges. The sought-after geology is submerged many hundreds of meters beneath icy polar waters. The team onboard were also interested to hunt for deeper pathways along the sea floor through which warm ocean water might be funneled to the ice edge, and where the ice might be melting.

A 5-m long orange submarine tooled to the hilt with geophysical instrumentation for sea-floor mapping and sensors for underway oceanographic observation was the main tool for Graham and the international team onboard. Autonomous underwater vehicles (AUVs) provide a unique and valuable platform for work in icy environments. Aside from their maneuverability and endurance, they can operate and remain in areas where ships cannot, even under extensive floating ice.



Photo 2, Caption: The University of Gothenburg's Kongsberg HUGIN AUV 'Ran', shown here, being launched in an open water polynya at Thwaites Glacier. The sub would be programmed to undertake 20-hour missions, combining programs of sea-floor mapping and mid-water column profiling and sampling, at and under Thwaites Glacier ice shelf.

HIGHLIGHTED RESEARCH

In choppy waters and high winds, the AUV undertook targeted missions, within submarine troughs predicted to be the conduits for warm water inflow, and over the tops of sills that likely served as resting spots for Thwaites in the past. Ran collected stunning imagery of the sea floor, including strange landforms formed by Thwaites Glacier decades or centuries ago. The AUV also obtained invaluable data on the whereabouts and circulation of warm water in the Thwaites vicinity. Missions included forays under the floating ice tongue, making the 2019 expedition pioneering as the first scientific deployment of any kind into the Thwaites ice shelf cavity.

The second THOR expedition took place in January–March 2020. Although the orange sub operated elsewhere, Graham used sonars mounted on the Palmer to continue the survey of the sea bed in front of Thwaites. The team also collected sediment cores at sites selected from the 2019 survey data, and acquired high-resolution seismic profiles to determine the properties of the bed that the glacier has retreated from.

The results so far have traced the origins of different parcels of water mixing beneath Thwaites, showing where and how the glacier is melting. Meanwhile, Graham continues to work at USF on the AUV sonar data.

“These data are likely to provide transformative insights into the geological imprint of ice sheets on the polar sea-floor. So, stay tuned in 2021!” said Dr. Graham.

OCEAN WHIRLPOOLS SPIN, CARBON GAS ABSORBED FROM AIR, NEW ROBOT SEES ALL

USF researchers are using autonomous vehicles to study how the ocean is responding to climate change.

In August of 2019, an autonomous Sailing vehicle (ASV) called a Saildrone achieved the first uncrewed circumnavigation of Antarctica. This orange-red Saildrone, its 7-m hull equipped with instruments to measure both ocean and atmospheric properties, was launched and retrieved from Bluff, New Zealand, and took almost seven months to achieve its goal. The drone survived a collision with an iceberg and numerous intense Antarctic winter storms, proving itself as a platform fit for high-latitude observing and piquing the interest of researchers such as Dr. Nancy Williams, Assistant Professor of Chemical Oceanography at USF CMS, who studies the Southern Ocean around Antarctica.

HIGHLIGHTED RESEARCH



Photo from NOAA Climate Program

Despite its remoteness, the Southern Ocean plays a key role in the climate system, accounting for about half of the ocean's drawdown of anthropogenic carbon from the atmosphere; this is the carbon released by humans through fossil fuel burning, cement production, and land use changes. Quantifying when, where, and how much excess carbon the ocean takes up is critical to understanding how the Earth's climate will respond to our ever-increasing carbon emissions. Typically, observations of ocean carbon fluxes are made from research ships. So-called "underway systems" suck water from the ocean's surface while the ship is moving and measure both ocean and atmospheric carbon dioxide (CO₂) content, allowing scientists to calculate a difference. Based on the CO₂ concentration difference, and some information about wind speed and ocean temperature, scientists can calculate whether the ocean is absorbing or releasing CO₂ at that time and place. A significant limitation to this approach is that a research vessel may only sample an area once every few years, primarily only in summer months, and will move through a particular area relatively fast. A SAILDRONE equipped with the ASVCO₂ system designed by the National Oceanic and Atmospheric Administration's Pacific Marine Environmental Laboratory utilizes a similar system for CO₂ concentration differences but because it is autonomous, it can measure more places in the Southern Ocean, do so any time of the year, and be programmed to stay in a particular area for a longer period of time to take repeat measurements.

HIGHLIGHTED RESEARCH

Dr. Nancy Williams, Assistant Professor of Chemical Oceanography at USF CMS, noticed something interesting in those data from the 2019 Antarctic Circumnavigation: that the ocean carbon content (and therefore “outgassing” of CO₂) was higher near ocean eddies.

Ocean eddies are large, energetic, circular swirls in the ocean, ranging in diameter from about 10 to 100 kilometers. These long-lived oceanic cyclones can rotate either clockwise or counterclockwise; this motion will mix water both horizontally and vertically between the ocean surface and the deep. They can also trap and carry water inside their walls for up to a year or longer and move over substantial distances in that time. Importantly, because eddies also lead to either a depression or a doming in the sea surface height, we can observe these eddies from space.

Dr. Williams reached out to Dr. Don Chambers, Professor of Physical Oceanography at USF CMS and an expert in observing sea surface height from satellites to discuss these findings. If they could use Saildrones to understand how a few representative eddies are affecting ocean carbon content, could they use quasi-daily satellite observations to “scale up” those very sparse ocean carbon observations and get a better estimate of the broader Southern Ocean carbon fluxes? After examining the 2019 data and considering the number of eddies present in the Southern Ocean at any one time (of the order of several hundred), they estimated the contribution could be significantly larger than previously estimated. They decided a proposal to the National Science Foundation was in order and got to work in summer of 2020, just as the COVID-19 pandemic really set in. At the time, Drs. Williams and Chambers didn’t know what the future would look like, but they knew that their autonomous drone- and satellite-based mission was COVID-proof, requiring no personnel travel or research ship time, and that could only be a good thing.

The National Science Foundation Office of Polar Programs agreed, and the proposal led by Dr. Williams, in collaboration with Dr. Don Chambers, and Dr. Eric Lindstrom, Chief Scientist at SAILDRONE, Inc., was recently funded to send two Saildrones back to the Southern Ocean in Austral winter (July-September) 2022 to target ocean eddies. This \$1.1M project is Dr. Williams’ first lead proposal and the first time NSF has funded research using Saildrones, as they usually use research ships.

INVESTIGATING WHALES, PENGUINS AND SEALS ON THE BOTTOM OF THE WORLD

It’s tough to study interactions between predators and their prey no matter where you are in the world’s oceans, but it’s especially challenging in the ice-covered Ross Sea

McMurdo Sound, Antarctica, at the southern end of the ice-covered Ross Sea, is not home to many people. But it is a center of challenging but exciting research about whales, penguins and seals for Dr. Kendra Daly, a postdoctoral fellow, Ben Saenz, and co-PIs from several other oceanographic institutions in the U.S.

The Ross Sea is less affected by humans than any ocean region on the planet; commercial fishing on krill and fish limited to some northern areas. It was designated as a Marine Protected Area in 2017 with the primary goal of conserving marine living resources. The Ross Sea, despite its icy nature, is

HIGHLIGHTED RESEARCH

highly productive. Several large polynyas, regions of open water surrounded by sea ice, support a large abundance of top predators, such as killer and minke whales, Adélie penguins, and Weddell seals. Although scientists have known for more than a century – since early explorers first arrived in this area in their quest to reach the South Pole – that these top predators, little is known about their menu of choice. Which species constitute their prey?

Predator-prey interactions are challenging to study anywhere in the ocean, but are even more difficult to study in ice-covered seas. Due to increasing winds, sea ice extent and sea ice duration have been expanding, unlike some other regions of the Southern Ocean where sea ice is decreasing.

The team behind this 2.5-month-long research effort did not use an icebreaker ship to sample the water column under the sea ice. Instead, most camped out on the fast ice in a central location of McMurdo Sound and traveled to different sampling sites using snow mobiles, towing sleds with equipment, and one Conestoga Wagon on skis, similar to the wagons used in the late 18th and early 19th century in the U.S. The Conestoga wagon contained a generator, heater, electronic equipment, computers and monitors - all of the comforts of a modern-day lab.



Caption: The SCINI ROV (in foreground) is being tested by a researcher prior to deployment, while the acoustic towed package is the white cylinder laying on the snow behind it. The Conestoga wagon “dry lab” is in the background. Photo credit: Stacy Kim.

HIGHLIGHTED RESEARCH

On station, a hole was drilled through the sea ice large enough to deploy the long, thin “SCINI” remotely operated vehicle (ROV) (see above). SCINI had video cameras and towed a package containing a high frequency acoustic echosounder (similar to a fish finder) and biological sensors, which were used to assess the abundance and distribution of prey (crystal krill and Antarctic silverfish) under the sea ice during spring and early summer.



Caption: Adélie penguins feed their chicks by regurgitating the food they captured in the water column at the ice edge. Euphausia crystallorophias (crystal krill) shown in the inset is about 1.5 inches long and is one of the primary prey of penguins. Photo credit: Kendra Daly.

Other members of the team worked out of McMurdo Station, analyzing water samples and data collected by the field team. Or, they were busy on the helicopter doing whale surveys. Just your average day on the bottom of the planet.

The remaining members worked at the nearby Adélie penguin colony at Cape Royds. Satellite bio-logging tags were placed on Adélie penguins and a minke whale to detect the timing, location, and depth of feeding. Penguin diet was monitored when adults returned to the nesting colony and fed their chicks. Whale abundance and feeding behavior were observed from helicopters and from land and the sea ice.

Throughout the study, krill abundance declined in surface waters as predation by penguins and whales increased at the ice edge. Instead, krill moved deeper in the water column at the ice edge and deeper

HIGHLIGHTED RESEARCH

under sea ice to avoid being eaten by air-breathing predators. Silverfish increased in penguin diets when competition from krill-eating minke whales increased.

In total, the results showed that this region is a biological “hot spot” in which the prey are controlled by predation, instead of by environmental processes. Despite documented changes in the ecosystem due to climate and fishing, decades long studies indicate that to date penguin, seals, and whale abundances have remained the same or are even increasing in the Ross Sea.

Additional long-term studies are needed to separate the effects of climate from fishing extraction and their combined impacts on the Ross Sea top predators.

Relevant publications:

Saenz, B.S., D.G. Ainley, **K.L. Daly**, G. Ballard, E. Conlisk, M.L. Elrod, and S.L Kim (2020) Drivers of concentrated predation in an Antarctic marginal-ice-zone food web. *Nature Scientific Reports* 10, 7282, <https://doi.org/10.1038/s41598-020-63875-y>.

Ainley, D., T. Joyce, B. Saenz, R. Pitman, J. Durban, G. Ballard, **K. Daly**, and S. Kim (2020) Foraging patterns of Antarctic minke whales in McMurdo Sound, Ross Sea. *Antarctic Science* 32 (6), 454-465, doi:10.1017/S0954102020000310.

USF AND NOAA LAUNCH WORLD-CLASS COOPERATIVE OCEAN MAPPING CENTER

COMIT's mission aligns with state, national and global goals to produce high-resolution maps of the seafloor using leading-edge technologies

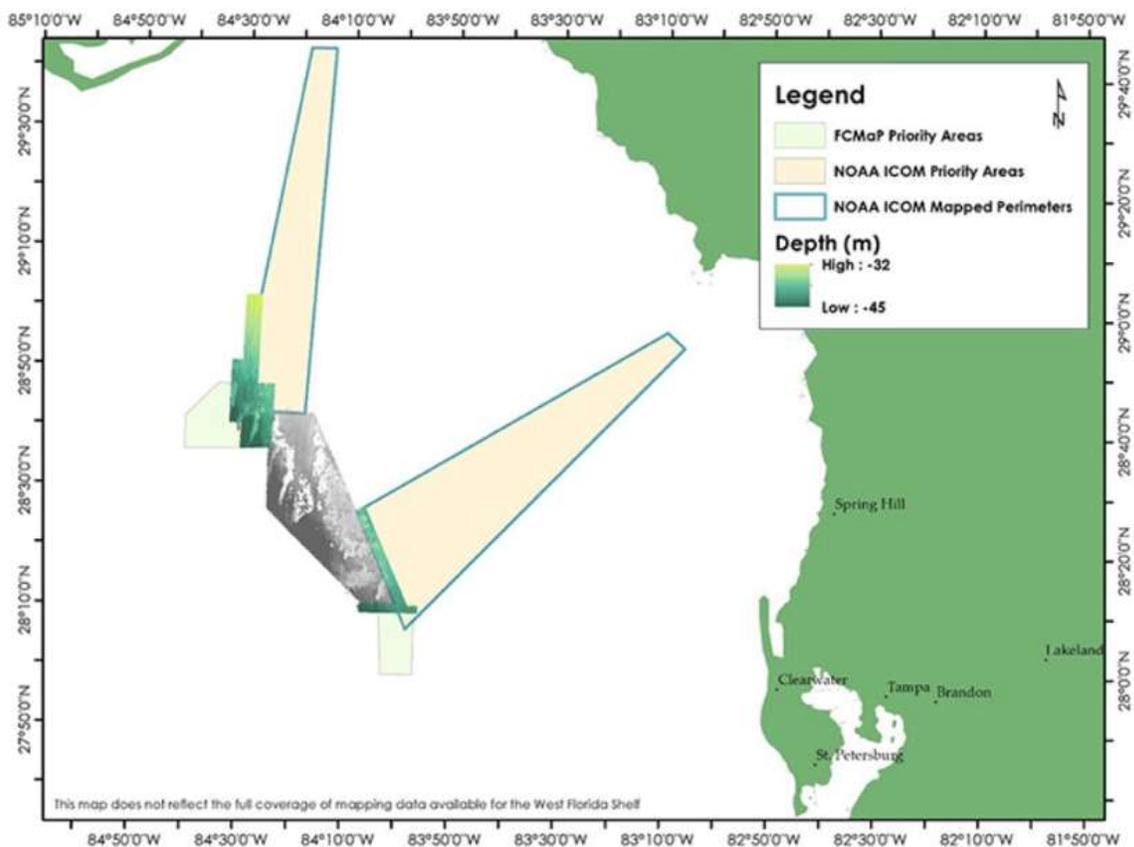
The University of South Florida's College of Marine Science was awarded a five-year, \$9 million cooperative agreement by the National Oceanic and Atmospheric Administration's (NOAA) Office of Coast Survey in late 2020 to launch the Center for Ocean Mapping and Innovative Technologies (COMIT). The center, located on the USF St. Petersburg campus, will develop new technologies and approaches to ocean and coastal zone mapping in line with NOAA's commitment to building resilient coastal ecosystems, communities and economies.

COMIT's initiatives are embedded in the larger objectives in the National Strategy for Mapping, Exploring and Characterizing the United States Exclusive Economic Zone (EEZ). To date, only a small percentage of the world's ocean floors have been adequately mapped. Having high resolution bathymetry, particularly in nearshore areas in the 0-40m depth range, can significantly improve safe navigation, ocean circulation model development, resource management, and our ability to assess sea level rise -- all top priorities for the state of Florida.

To accomplish these goals, COMIT faculty, research associates, technicians, staff and students are partnering with other local and state agencies and industry representatives to push the limits of existing technologies into the realm of uncrewed systems, technology integration, artificial intelligence, and autonomy.

HIGHLIGHTED RESEARCH

Priority regions for mapping have already been identified by one of COMIT’s stakeholders, the Florida Coastal Mapping Program (FCMaP), whose mission it is to “collaborate and facilitate the collection of high-resolution Florida coastal seafloor data, from the shore to the continental shelf.” By leveraging partnerships like this and others, such as NOAA’s Integrated Ocean and Coastal Mapping (IOCM) program, COMIT takes a collective approach to the missions of the center. Aligning itself with other programs like the IOCM, COMIT is planning to contribute bathymetry data from the Big Bend region in the northeast Gulf of Mexico. This region is important to the State of Florida’s Division of Aquaculture that needs to characterize areas sited for offshore aquaculture leases.



Caption: The light green and orange polygons in the map show the areas in the Big Bend of Florida that are prioritized for mapping by the Florida Coastal Mapping Program (FCMaP) and NOAA’s Integrated Ocean and Coastal Mapping (IOCM) Program. The depths shown in grayscale were mapped by Dr. David Naar’s team (Naar is a COMIT co-PI) in the mid-2000s. The areas indicated by the yellow to blue color depth scale were mapped by COMIT researcher Matthew Hommeyer and his team in October 2020 and February 2021; this also includes the perimeters of the two NOAA IOCM yellow areas surrounded by the blue outlines.

The COMIT team forged and leveraged an additional partnership in 2020 with the Port of Tampa to review and demonstrate the utility of uncrewed vessels to map the shallow and dynamic regions of the Port, operated remotely from a ‘mothership’. This information can be of critical importance in a

HIGHLIGHTED RESEARCH

natural disaster response setting where navigable waters are crucial to the transport of supplies and resources (including the Piney Point Spill occurring in 2021).



Caption: The demonstration from Romeo Papa's 12' and 24' MANTAS systems at the Port of Tampa took place October 20-21, 2020.

In addition, the COMIT team leveraged a research cruise funded by NOAA's IOCM to map the priority area of the Big Bend region in the northeast Gulf of Mexico to test the applicability of incorporating a moving velocity profiler (MVP) into the center's survey designs. This technology will improve bathymetry measurements in areas of high salinity/turbidity and allow for more efficient survey operations.

Professional development, education and outreach are three additional key initiatives of the new center. Faculty from the College of Marine Science are cataloging the current curricula within the College and related University programs to develop a new Hydrography concentration, consistent with IHO (International Hydrographic Organization) accreditation standards. The new academic program will be one of four in the country and will train and educate future generations of hydrographers and scientists who will carry the skill set to respond to an emerging breed of societal and scientific challenges related to climate change and the need for sustainable resources.

COMIT researchers spent most of 2020 proposing and then building the outward-facing landscape of the center in ways that will engage the broader community. The website was launched in December 2020 and has been under constant refinement and expansion. With a diverse pool of collaborators, COMIT developed a monthly, hour-long virtual seminar series that covers a wide range of topics related to COMIT's research goals including: safe navigation; women in hydrography; advanced technology/engineering in seafloor mapping and exploration.

HIGHLIGHTED RESEARCH

THE USF COLLEGE OF MARINE SCIENCE GLIDER FLEET: RED TIDES, HURRICANES, CIRCULATION MODELS, AND FISH

The year 2020 was a record-breaking year for the USF glider team—208 glider days at sea

USF has conducted routine glider deployments on the West Florida Shelf since 2010. Gliders, which look like yellow torpedoes, help scientists better understand red tides, forecast hurricanes, improve circulation models run by national and local partners, and gain insight into fish populations.

Each glider is equipped with a standard sensor package (CTD for conductivity-temperature-depth, fluorometers, dissolved oxygen sensor). Several of our fleet are also equipped with enhanced sensor packages that generate specialized data sets, including passive acoustic recordings, data from tagged fish, nitrate concentrations, and more.

“Glidors give us the eyes and ears we need 24-7 in the ocean, at a fraction of the cost of a research vessel,” said Research Faculty member and Project Engineer Chad Lembke. “They can collect valuable data to help understand ocean circulation, red tides, hurricanes, fish populations and habitats—all at the same time.”

During the past year, the glider team conducted 10 glider deployments, resulting in 208 glider days at sea, which is a USF record. These were conducted on both the east and west coasts of Florida, and up to North Carolina. All deployments were conducted in full accordance with COVID guidelines provided by USF and collaborating institutions.

West coast Florida deployments were conducted in collaboration with our partners at the Florida Wildlife Research Institute (FWRI), the Gulf of Mexico Coastal Ocean Observations System (GCOOS), and the Southeast Coastal Ocean Observing Regional Association (SECOORA). These deployments in the region west of Pinellas County focused on understanding the evolution and progression of red tide; quantifying the heat content in the water column for hurricane forecasting; and exploring the capability of gliders to help better understand fish migrations, a new area for glider research. USF is now the owner of the first fisheries based echosounders by two manufacturers, which are now being recognized as emerging tools to do long term sustained observations of fish biomass in coastal regions.

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USF West coast glider deployments since mid-2020 with focus on understanding red tide, hurricane strength forecasting, and fish populations.

Glider deployments on the east coast of Florida were done in partnership with collaborators from the University of Georgia, University of North Carolina, the North Carolina Coastal Studies Institute, and SECOORA. The key focus was evaluating the heat content of the water column in the areas where the Gulf Stream interacts with coastal waters. This heat fuels hurricanes. These deployments ranged up to over 500 nautical miles along the eastern seaboard, providing valuable water column data to researchers at the Naval Research Laboratory and the National Oceanographic Atmospheric Administration.



USF East coast glider deployments since mid-2020 focusing on the interaction with the Gulf Stream and the coastal shelf as well as providing heat content to hurricane predictions models.

All data collected by the gliders was shared in satellite decimated format with research partners through the NOAA IOOS Glider Data Assimilation Center, as well as in full format post-deployment.

Faculty Highlights

FACULTY AWARDS:

- **Dr. Kristen Buck** was elected to the 2020 Board of Directors for the Association for the Sciences of Limnology and Oceanography (ASLO) as a Member-At-Large
- **Dr. Chuanmin Hu** was elected to the Academy of Science, Engineering and Medicine of Florida
- **Dr. Cliff Merz** was selected as senior member of the National Academy of Inventors in recognition of his achievements in inventing marine-based renewable energy technology
- **Dr. Amelia Shevenell** was nominated to the National Academies Committee on a Mid-Term Assessment of NSF Progress on the 2015 Strategic Vision for Antarctic and Southern Ocean Research

TENURED AND TENURE-TRACK FACULTY ANNUAL UPDATES:

Below are select 2020 highlights reported by faculty, along with their students and staff. Publications for CMS faculty are listed in a separate section.

DR. CAMERON AINSWORTH (Fisheries Biology; Ecosystem and Resource Management)

In 2020, Dr. Ainsworth's laboratory achieved significant milestones. They concluded a ten-year research project studying the Deepwater Horizon oil spill. Kelly Vasbinder graduated her PhD and took a job at UC. She produced an exceptional thesis. She made a real advance in understanding connectivity of the gulf, and advanced modeling methodology by incorporating a statistical model of larval movement into Atlantis. This complements trophic connectivity under study by Becky Scott. Other work includes a modeling comparison of natural and artificial reefs and the value of sea grass habitat.

Dr. Ainsworth has been heavily involved in the synthesis and legacy of GOMRI, including contributing to at least 5 papers (GOMRI core areas 3, 5, 7B), organizing webinars with other GOMRI scientists, and organizing a session in GOMOSEs. Dr. Ainsworth is leading a modeling-based synthesis paper that has contributions from all of the modeling GOMRI Consortia. Service included serving on a NOAA OA review panel, reviewing articles, participating in Skype a Scientist, presenting at GOMOSEs. Dr. Ainsworth served on the Gulf of Mexico Fisheries Management Council Ecosystem Science and Statistical Committee. Dr. Ainsworth contributed to the environmental impact review process for Mississippi River sediment diversions conducted by Louisiana's Coastal Protection and Restoration Authority.

DR. MYA BREITBART (Genomics; Marine Microbiology; Wastewater Microbiology; and Virology)

Dr. Mya Breitbart's genomics and microbial ecology laboratory had an extremely successful year, making progress on several research areas, including: 1) Microbial ecology of Florida's freshwater springs, 2) Using viral metagenomics to identify and describe the viral communities in a variety of environments and organisms, 3) Inclusion of DNA barcoding into marine biodiversity surveys, and 4) Microbial water quality and risk assessment of recreation activities in coastal seawater. The Breitbart

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lab published seven peer-reviewed scientific manuscripts reflecting these main research initiatives and several interdisciplinary collaborations. Especially noteworthy are the first description of bacterial and viral communities in Florida's freshwater springs (Malki et al. 2020), an international collaboration describing fish egg connectivity between Florida and Cuba (Kerr et al. 2020), and a novel approach using environmental DNA metabarcoding to simultaneously examine marine biodiversity across multiple trophic levels (Djurhuus et al. 2020). The Breitbart lab kicked off 2020 by hosting an Art & Science Night exhibiting science-inspired artwork that was created by local artists after visiting the College of Marine Science, meeting scientists and learning about their research through hands-on activities. Although the COVID-19 pandemic prevented subsequent in-person community outreach activities, the Breitbart lab pivoted to online engagement, preparing a series of educational videos about water quality research, creating a web-based "DNA Detectives" activity for elementary school students, and offering a remote exhibit at the Saint Petersburg Science Festival.



DR. KRISTEN BUCK (Trace Metal Biogeochemistry; Metal-Binding Organic Ligands)

Dr. Kristen Buck had four active NSF awards and five non-NSF awards in 2020; Buck is lead PI of a 5-year \$2.75 million project funded in 2020 to study red tides on the West Florida Shelf. Buck's lab group sailed on two research expeditions in 2020 related to these projects; four additional expeditions were postponed or canceled due to the COVID-19 pandemic. Buck's research was published in *The ISME Journal*, *Limnology and Oceanography*, *Marine Chemistry*, and *ACS Earth and Space Chemistry* in 2020. A PhD student and an MSc student from Buck's lab each first authored 2020 publications.

Buck continues to serve on the Editorial Board for *Limnology and Oceanography: Letters* as an Associate Editor. Buck was elected to the Association for the Sciences of Limnology and Oceanography (ASLO) Board of Directors for a 3-year term as a Member-At-Large in 2020. Buck also served as the Chair of the 2020 Ocean Sciences Meeting representing The Oceanography Society (TOS).

Buck currently supervises 3 PhD students and one MSc students; two of these students are underrepresented minorities in science, three are women. Buck graduated a PhD student in 2020, Travis Mellett, who is now a postdoctoral scholar at the University of Washington. Buck co-taught

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Professional Development II (Spring, lead instructor), the Chemical Oceanography core course (Fall), and Professional Development I (Fall) in 2020.

DR. ROBERT BYRNE (Marine CO₂ System Chemistry and Ocean Acidification; Seawater Trace Element Chemistry; and Development of In Situ Methods and Instrumentation for Analysis of Seawater)

Dr. R.H. Byrne published two papers in 2020 that were first-authored by his own students. Two additional manuscripts that were first-authored by his own students were submitted for publication in 2020. Six manuscripts co-authored by RH Byrne were submitted for publication by authors external to USF.

Dr. R.H. Byrne received one US patent in 2020 and submitted one application for a US patent.

Dr. R.H. Byrne received one new three-year NSF funding award in 2020 and a second three-year NSF proposal was recommended for funding. Funding for the latter award began in 2021.

Dr. R.H. Byrne graduated one PhD student in 2020.

DR. DON CHAMBERS (Using satellite observations to understand climate change and ocean dynamics)

Last year, Dr. Chambers contributed to several papers on understanding modern sea level change, especially in understanding the predictability of extreme sea level events at 10-year lead times. His Ph.D. student (Jessica Caggiano) was selected as a Future Investigator in NASA Earth and Space Science and Technology (FINESST). This fellowship will fund her research into understanding how large waves in the Southern Ocean will affect sea level observations from an upcoming satellite mission. Dr. Chambers was also selected to be a member of the 2020-2024 NASA Sea Level Change Team.

DR. TIM CONWAY (Marine trace elements, trace metal isotopes, biogeochemistry, marine geochemistry, GEOTRACES)

In 2020, despite the challenges of the COVID-19 pandemic for lab and field research, Dr. Tim Conway continued to carry out world-leading chemical oceanographic research. Dr. Conway published two research articles in 2020, with one of these first authored by a graduate student, as well as authoring 5 invited talks and 22 other conference presentations. Both articles featured the cycling of micronutrients (iron, zinc, cadmium, nickel, copper) or the anthropogenic contaminant metal (lead) in the climate-critical Southern Ocean, as part of the Swiss-led Antarctic Circumnavigation Expedition. Conway is also federally funded by NSF to participate in the US GEOTRACES program, including three cruises from Alaska-Hawaii-Tahiti, and Tahiti-Antarctica-Chile, and is involved with German, Dutch, UK and Japanese oceanographic research programs. In 2020, Dr. Conway also received Florida Institute of Oceanography ship-time in the Gulf of Mexico for field research on nutrient cycling on the West Florida Shelf. Adapting to the reality of 2020, Dr. Conway chaired a virtual session at the 'global' Goldschmidt Conference in 2020. Dr. Conway continues to develop and teach graduate courses at USF which aim to equip students with the critical thinking skills and the cutting-edge scientific knowledge to succeed in global research. These endeavors included graduating his first USF Masters Student, who completed a thesis on the cycling of the micronutrient iron in the South Atlantic Ocean, and mentoring a Research Experience for

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Undergraduate (REU) student who won 1st Prize for his poster presentation at the national Emerging Researchers in STEM conference in Washington DC.

DR. KENDRA DALY (Zooplankton Ecology; Gulf of Mexico and Antarctic Ecosystems; Low Oxygen Regions in the Ocean; Ocean Observatories; Sensor Technology)

Dr. Kendra Daly, her postdoctoral fellow, Ben Saenz, and co-PIs published two companion papers investigating predator-prey interactions in McMurdo Sound, a coastal marine system off of Antarctica at the southern end of the Ross Sea. Predator-prey interactions are challenging to study in the ocean and are even more difficult to study in ice covered seas. This ice edge region is part of a newly formed Marine Protected Area, which supports a large abundance of top predators, such as killer and minke whales, Adélie penguins, and Weddell seals. Although the high densities of these predators have been known for more than a century, ever since explorers first arrived in their quest to reach the South Pole, little is known about the prey of these iconic predators. Satellite bio-logging tags were placed on Adélie penguins and a minke whale to detect the timing, location, and depth of feeding. Penguin diet was monitored on return to the nesting colony and whale abundance and feeding behavior was observed from helicopters and from land. The abundance and distribution of prey (crystal krill and silverfish) were quantified using a high frequency acoustic echosounder on a remotely operated vehicle (ROV). Krill abundance declined in surface waters as predation by penguins and whales increased at the ice edge. Instead, krill moved deeper in the water column at the ice edge and deeper under sea ice to avoid being eaten by air-breathing predators. Silverfish increased in penguin diets when competition from krill-eating minke whales increased. The results show that this region is a biological hot spot in which the prey are controlled by predation instead of environmental processes.

DR. JACQUELINE DIXON (Igneous Petrology; Mantle Geochemistry; Role of Volatiles in Magmatic Processes; Deep Earth Geochemical Cycling of Volatiles)

Dr. Dixon served as Dean from January 1, 2020 to June 30, 2020. In addition, she chaired the search for the FIO Director, which concluded successfully with the hire of Monty Graham. She has been on professional development leave from July 1, 2020 to December 31, 2020, which continues through May 2021. She initiated and led the effort as PI to submit a NSF proposal to the Coastlines and People (CoPe) initiative due October 28, 2020. This proposal requested ~\$10 million over 5 years to establish a multi-disciplinary center for coastal sustainability at USF. She continued her professional service at the national level including serving as a member of the Advisory Board for the Smithsonian National Museum of Natural History, where she also serves on the NMNH Science and Public Outreach subcommittees. Her previous service as Chair of the Board for the Consortium for Ocean Leadership and as member of the NOAA Ocean Exploration Federal Advisory Board ended in October 2019 and May 2020, respectively

DR. BORIS GALPERIN (Atmospheric; Oceanic and Planetary Turbulence; Theory, Modeling, Experiments)

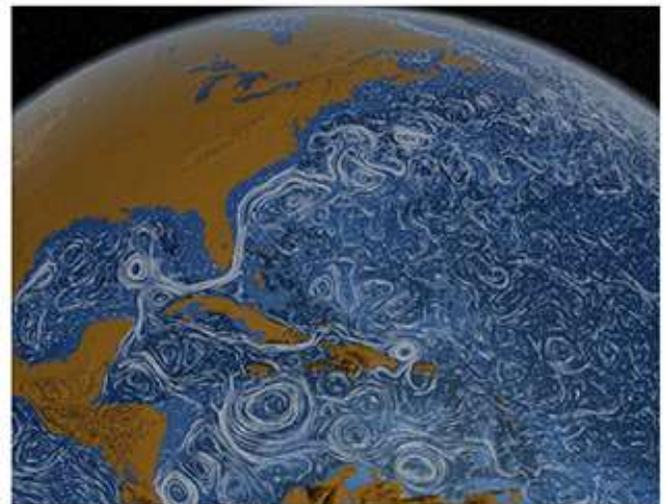
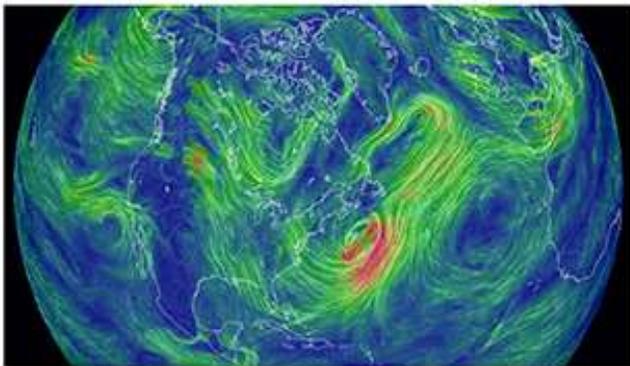
In 2020, Dr. Galperin and his colleagues published 3 papers in different areas. Each paper made an important contribution. In the paper published in Physical Review Fluids, they derived, for the first

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time ever, theoretical expressions for the horizontal kinetic energy spectra of oceanic and atmospheric circulations. The theory casts doubt upon some results following from the theory of geostrophic turbulence that were considered classical since the publication of the paper by Charney in 1971. The paper is expected to have an impact on many subfields including satellite altimetry. The importance of the paper has been recognized in a specially dedicated article in *Advances in Engineering*.

The paper published in *Geophysical Research Letters* explores the analogy between stably stratified and rotating fluids and applies the method developed previously to estimate the rate of the inverse energy cascade in a laboratory to the weather layers of Jupiter and Saturn. This is an important characteristic of the planetary circulations and the ability to estimate it from limited data will go a long way in studies of giant planets in the Solar System and exoplanets.

Finally, the third paper, published in the *Physics of Fluids*, describes the eddy - Rossby wave dualism and suggests that some of the observed ocean eddies are solitary Rossby waves referred to as zonons. This term was coined in one of the previous publications of Dr. Galperin's group where they were discovered in computer simulations. This is an ongoing research that is expected to yield new exciting results in 2021.



DR. ALASTAIR GRAHAM (Sea-floor Geophysics; Antarctic Marine Geology and Geomorphology; Past Changes in Earth's Cryosphere; Autonomous Instruments for Sea-floor Exploration)

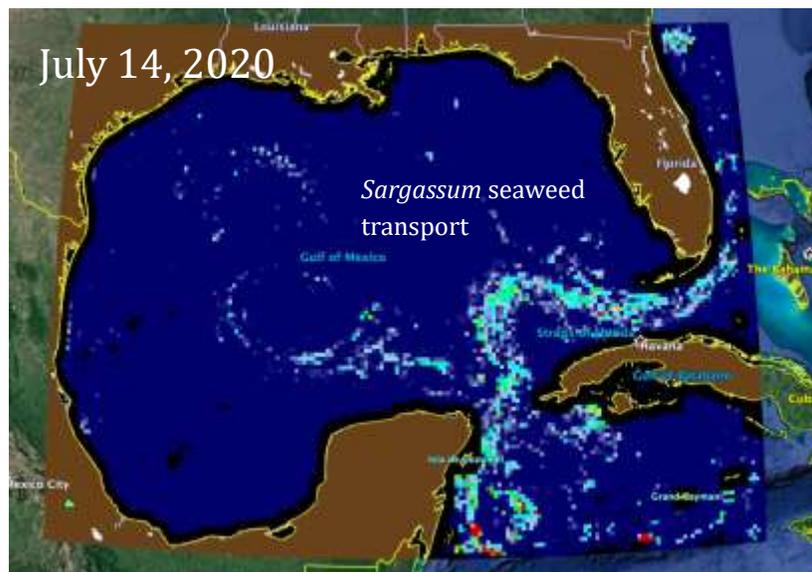
In 2020, Dr. Graham was one of the lead PIs on a five-year, \$8.9 million cooperative agreement awarded by the National Oceanic and Atmospheric Administration's (NOAA) Office of Coast Survey to launch the Center for Ocean Mapping and Innovative Technologies (COMIT) at USF College of Marine Science. Graham's lab received \$580,469 directly for applied hydrographic work that will be a key branch of the Center. Renovation of a new geophysical laboratory space was completed at CMS in Spring 2020 and will become the home of Graham's lab, serving as a burgeoning hub for graduate research in sea-floor mapping and exploration. For a second season in succession, Graham spent 61 days at sea in early 2020 undertaking intensive ship-based fieldwork at the front of Thwaites Glacier, in a remote region of West Antarctica, on the US Antarctic Program Icebreaker vessel *Nathaniel B*

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Palmer. Two important papers from the 2019 Antarctic field season were published in the journal *The Cryosphere* during the course of the year; one describing the bathymetry of the Thwaites coastal region, the other describing the shape of the sea bed underneath West Antarctica's floating ice shelves derived from airborne gravity data. Both are supported by the \$2 million NSF-NERC funded 'THOR' (Thwaites Offshore Research) project, on which Graham is a Co-PI. Graham received an Antarctic service medal in 2020 for his participation in the 2019 fieldwork. He convened two sessions at the virtual AGU 2020. He currently sits on the Editorial Board of the *Journal of Glaciology* as Scientific Editor.

DR. CHUANMIN HU (Ocean Optics and Optical Remote Sensing)

In 2020, Dr. Chuanmin Hu and his Optical Oceanography Lab continued high scholarly productivity. With an annual expenditure of > \$1M, Dr. Hu's group published 16 peer reviewed papers and submitted another 17. In addition, they continued to support the research community and other stakeholders through providing near real-time information on the location and amount of *Sargassum* seaweed. They also distributed monthly *Sargassum* bulletins to many groups to support local mitigation efforts as *Sargassum* represents a beach nuisance if large amounts are washed on shore. For his scholarly achievements and service to the community, in 2020 Dr. Hu was elected to be a member of the Academy of Science, Engineering and Medicine of Florida (ASEMFL).



DR. MARK LUTHER (Maritime Safety and Security; Real-Time Ocean Observation Systems; Numerical Models of Ocean Circulation; Coastal Water Quality)

Dr. Mark Luther has initiated a partnership with Pole Star Global (see <https://www.polestarglobal.com/>), the primary supplier of vessel tracking data to the US Coast Guard and other federal agencies. With colleagues Dr. Steve Meyers in CMS and Prof. Yasin Yilmaz in the USF College of Engineering, Prof. Luther is merging vessel tracking data from Pole Star with other

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environmental data sources to analyze ship movements using Artificial Intelligence and Machine Learning. Applications include predicting optimal arrival times for vessels calling on port facilities around Florida and the Gulf of Mexico as well as automated detection of anomalous vessel movements – ships doing something suspicious that could indicate a threat. Recent publications have addressed how ships visiting Tampa Bay (the largest port in Florida) will be affected by sea level rise and associated changes in tides and currents in the main ship channels. Pole Star’s US headquarters are located in St. Petersburg, near the USF/CMS campus, and has established cooperative agreements with USF/CMS. Pole Star has provided the USF team with access to their MDA platform and other data services at no cost, providing all vessel tracking data needed for multiple research efforts recently funded by the NOAA National Ocean Service.

DR. GARY MITCHUM (Climate Change; Ocean Eddies; Satellite Remote Sensing; and Sea Level Rise/Associate Dean for Research)

Dr. Gary Mitchum was very proud to be recognized by the university as one of the “Heroes Among Us” for his efforts to help the College of Marine Science continue to function in the face of the COVID pandemic. He was the college’s pandemic point person from March onwards and continues in that role today. In response to the pandemic the university had to severely limit travel and restrict campus access to essential personnel. Our college researchers needed to do fieldwork that requires travel and to participate in cruises to gather data. They also needed access to our labs in order to keep the data that supports our students’ academic progress and our ability to satisfy the requirements of our funded research projects flowing. Dr. Mitchum worked with the COVID Task Force and the CMS faculty to develop ways to be able to approve necessary field work and travel and to allow access to the laboratories. Things were difficult, but at the end of the day, the procedures he put in place allowed the people in the college to carry out their field work, to work in their labs, and to graduate their students, all while minimizing the risks to our college community.

DR. PAMELA HALLOCK MULLER (Biological, Environmental and Evolutionary Controls on the Production and Accumulation of Carbonate Sediments; Geologic History of Reefs; Modern Coral Reefs; Shelf Ecology; Environmental Management; Micropaleontology; Paleooceanography; Paleocology)

D. Pamela Hallock Muller spent much of 2020 working from her home office, writing, coaching writing, and editing. Dr. Hallock’s major paper in 2020 was entitled “What is happening to the world’s coral reefs?”, published in *Troubled Waters: The Science Behind Our Coastal Crisis* in the Springer Climate Series, along with a senior-authored paper written in 2020 and published online in February 2021. She also co-authored two papers with former PhD students, and three papers with the international PhD students with whom she had worked in the field or in a writing workshop in 2019 (with another published online in 2021). She began the year teaching a fully enrolled hybrid course (simultaneous in person/ online) “Writing a Scientific Paper” in Spring Semester, transitioning to completely online after Spring break. She also coached two students in an Independent Study section in the Fall, assisting one student with the first paper from his dissertation and the other to organize her research and write a substantial portion of her MS thesis. Dr. Hallock also became dissertation advisor for a PhD student,

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Natalia Lopez-Figueroa, working with her to develop a dissertation proposal, which Natalia presented to her dissertation committee in October. Natalia also has two manuscripts in preparation. In addition to typical USF and CMS committee assignments, Dr. Hallock reviewed about 25 manuscripts for journals and proposals for funding agencies, and pre-reviewed several others for international scholars for whom English is not their first language.

DR. FRANK MULLER-KARGER (Changes in Marine Ecosystems Using Field-based and Satellite Remote Sensing Time Series)

Muller-Karger published 12 peer-reviewed manuscripts in 2020. Several papers are part of a concerted international effort to explain to the public and policy-makers why it is important to make scientific observations of life in the sea, and guide the science and management communities to collect and store data in a standardized manner. The goal is to facilitate the use of biological data in assessments and decisions that affect society. One high-impact paper described the mechanisms that cause the annual formation of Sargassum algae blooms in the tropical Atlantic Ocean, explaining previous observations of these blooms.

Muller-Karger supported 8 people through grants at USF, including one master's student, three PhD students, and four postdocs. Muller-Karger continued to work to increase student diversity within the college.

As a Principal Investigator of the NSF Ocean Obs Research Coordination Network (RCN), Muller-Karger provided guidance to Federal agencies and international bodies on priority research areas. The groups include the Interagency Ocean Observing Committee, Ad-hoc Interagency Committee on Biodiversity, the international OceanObs committee, and various programs of the Intergovernmental Oceanographic Commission (IOC). The advice distilled recommendations from the OceanObs'19 conference and several meetings sponsored by the OceanObs RCN.

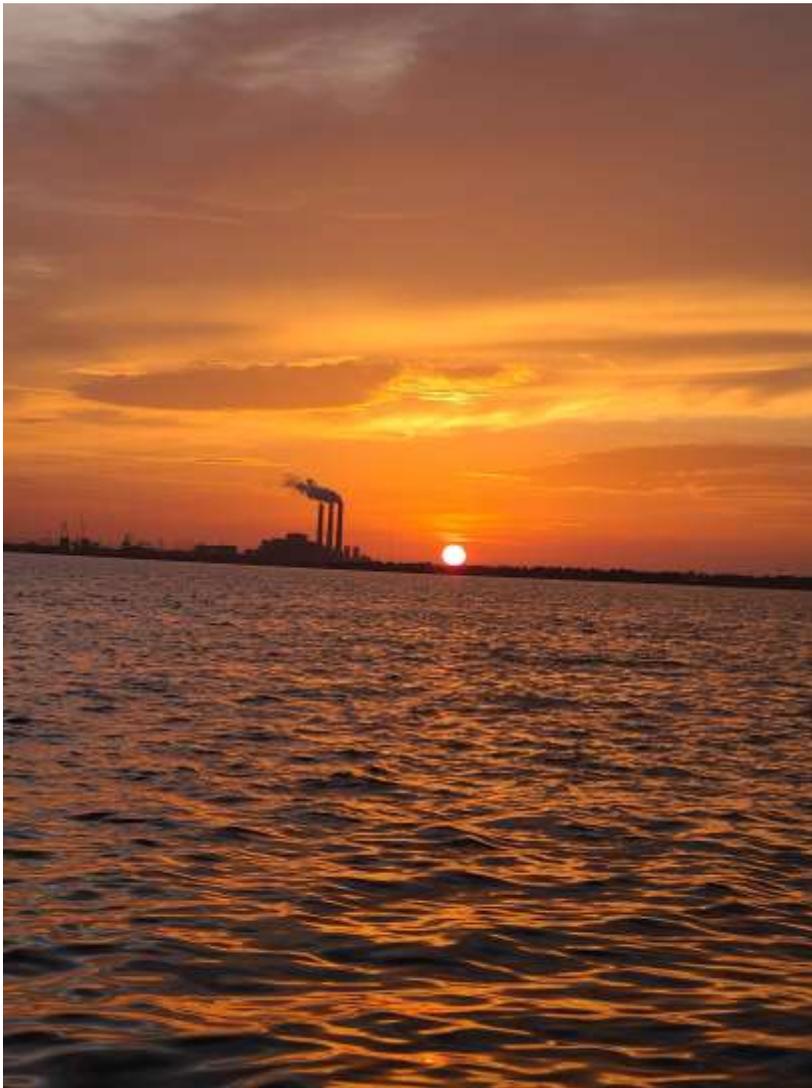
Muller-Karger served in college committees and in the Integrated Marine Biosphere Research (IMBeR) Science Steering Committee, the steering committee for the Ocean Best Practices System at the IOC, the IOC's Bio-Eco Panel of the Global Ocean Observing System, and co-chaired the Marine Biodiversity Observation Network (MBON) of the Group on Earth Observations (GEO).

DR. STEVE MURAWSKI (Population dynamics of exploited marine species; impacts of fishing and other anthropogenic stresses on marine ecosystems; ecosystem modeling and analysis /St. Petersburg Downtown Partnership Peter R. Betzer Endowed Chair)

The Murawski Laboratories (consisting of elements of the C-IMAGE consortium and the C-Scamp mapping projects) had an impactful year 2020 despite the challenges imposed by the COVID-19 crisis. Two very significant research programs were finalized in 2020 including the Center for Integrated Modeling and Analysis of Gulf Ecosystems (C-IMAGE, funded by GoMRI) and the Continental Shelf Characterization, Assessment and Mapping Project (C-SCAMP, funded by NFWF). C-IMAGE resulted in over \$36 million coming to USF-CMS and partner institutions, resulting in over 200 publications. The major research deliverable produced by C-IMAGE was a two volume book series published in 2020 consisting of 63 chapters with over 115 authors for each volume. Murawski co-edited the volumes

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and authored or co-authored 13 chapters, among the two volumes. C-SCAMP, funded by a \$4.4 million grant, resulted in over 2,300 km² of new habitats mapped on the West Florida Shelf. The Murawski Lab also participated in the “Great Red Snapper Count” in the Gulf, which resulted in a three-fold increase in the abundance of red snapper as compared with traditional stock assessment techniques. Despite the COVID-19 restrictions on activities, the lab completed highly successful expeditions to sample pelagic predators off Texas and to collect sediment and fish samples to monitor PFAS pollution in Tampa Bay. Murawski was also the lead PI for a successful proposal to establish the Center for Ocean Mapping and Integrative technologies (COMIT), a \$9 million, 5-year Cooperative Agreement with the NOAA Office of Coast Survey. Most importantly, the program graduated two Ph.D. and two M.S. students (Susan Snyder, Kristina Deak, Brigid Carr and Maddie Schwaab).



Sunrise over a Tampa power plant while surveying fish and sediments in Tampa Bay, summer 2020. The project, funded by the Tampa Bay Estuary Program, seeks to characterize PFAS pollution in Bay resources.

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DR. DAVID NAAR (Marine Magnetism; Mid-Ocean Ridge and Hotspot Interactions; Plate Tectonics; Seafloor Mapping with High-Resolution Multibeam Sonars of Artificial and Real Coral Reefs, Mines, Paleoshorelines, Hydrothermal Vents, and Fish Habitats; and Wax Analog Modeling of Seafloor Spreading Processes/Associate Dean for Graduate Studies)

Dr. David Naar assisted in writing and submitting a large team-effort proposal (led by Dr. Steven Murawski) for a five-year, \$9 million cooperative agreement with the National Oceanic and Atmospheric Administration's (NOAA) Office of Coast Survey to launch the Center for Ocean Mapping and Innovative Technologies (COMIT). This proposal was funded in October of 2020 and Dr. Naar is tasked to coordinate and develop curriculum within USF (multiple colleges) in the forms of certificates and eventually a hydrographic-type concentration within a proposed professional non-thesis Master of Arts degree in Marine Studies at USF. In addition to this large effort, he is also will be directing new employees on culminating and reprocessing a decade of multibeam transit data, for final archives and dissemination starting in late 2021. Beyond this research initiative, he advised or co-advised five students, taught part of two courses, and worked diligently to meet the demands related to the Consolidation of USF, Graduate and Professional Student Success Task Force, and the academic challenges to USF and the college resulting from the onslaught of the COVID-19 Pandemic.

DR. ERNST PEEBLES (Biological Oceanography/Marine Resource Assessment)

During 2020, Dr. Ernst Peebles continued serving as Principal Investigator on a grant that established USF as part of the Florida RESTORE Act Center of Excellence Program (FLRACEP). This FLRACEP project originally required labor-intensive research cruises aboard vessels operated by FIO. Given COVID-19, it became apparent that having students and faculty working in close quarters aboard research vessels would be infeasible. The purpose of the research cruises is to provide surveys of fish eggs that can be found floating along Florida's coast. The eggs are only identifiable via DNA barcoding. Dr. Peebles was aware that NOAA Fisheries was conducting similar fish-egg surveys without having a means of identifying the eggs they collected, and they were instead archiving unprocessed samples at Stennis Space Center. NOAA Fisheries was using an automated system to collect the eggs, which allowed them to safely reduce the number of crew on their cruises. Dr. Peebles discussed these circumstances with NOAA Fisheries and proposed substitution of the automated collections for those that would have ordinarily been collected by USF. The arrangement that unfolded was recognized as a win-win situation; Dr. Peebles formally proposed the change to FLRACEP, who approved the revision. USF's barcoding of NOAA Fisheries' egg samples is now ongoing in Dr. Breitbart's lab. As part of this project, we published "DNA barcoding of fish eggs collected off northwestern Cuba and across the Florida Straits identifies the significance of egg transport by mesoscale eddies" in the journal [Fisheries Oceanography](#). Dr. Chuanmin Hu's lab was instrumental in making this paper truly interdisciplinary.

DR. BRAD ROSENHEIM (Paleoceanography/Paleoclimate, stable isotopes, carbon cycling)

In 2020, prior to the pandemic, Dr. Rosenheim graduated a M.S. student Carey Schafer. Carey worked on mangrove carbon cycling, and her work with Dr. Rosenheim represented a new avenue of research for the Rosenheim group. Mangrove ecosystems bury organic carbon sequestered from the

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atmosphere. Coupling two widely used chronometers (^{210}Pb and ^{14}C), Dr. Rosenheim's group identified a process by which these ecosystems are able to couple young carbon with older soil horizons. This active pumping of sequestered atmospheric carbon downward in an ecosystem under pressure from increased rates of sea level rise is an important advance in understanding coastal carbon cycling. Simultaneously, Dr. Rosenheim continued to be busy with publishing results from the Subglacial Antarctic Lakes Scientific Access (SALSA) project. Dr. Rosenheim supervised a Ph.D. student-led publication of initial results in the journal *Geophysical Research Letters*. The Ph.D. student leading the study, Ryan Venturelli, was slated to graduate in early 2021. The paper described unequivocal evidence that the grounding line (boundary between grounded and floating ice) of the West Antarctic ice sheet had retreated further landward than its current position in the early Holocene (~9,000 years ago). This significant finding suggests that this ice sheet responded in the past to something other than climate, and that the scientific community must be aware of thresholds and tipping points related to ice dynamics in assessing the future contribution of WAIS to global eustatic sea level rise.

DR. BRAD SEIBEL (Physiological response of marine animals to extreme environments, ocean acidification, deoxygenation and warming, polar and deep-sea biology, biology of mollusks)

Dr. Brad Seibel's research in 2020 focused on the response of marine animals to ocean warming and deoxygenation. He published a novel quantitative relationship between the oxygen and temperature sensitivities of marine animals that, despite nearly a century of study, had gone unrecognized. The relationship provides the ability to map habitat that is metabolically available and how that habitat will shift with changing climate. It provides a precise measure of the decrement in metabolism and the scope available for growth and reproduction with declining oxygen and increasing temperature. The relationship was used to develop a new method for determining oxygen supply capacity in animals that is now in press. It has spawned numerous additional projects detailing novel attributes for various marine species and ecotypes (e.g. ram ventilation in sharks, extreme temperature sensitivity in vertical migrators, gill development in larval fishes, success of invasive lionfishes). This work generated publications in 2020 in *Nature*, *Science Advances* and the *Journal Experimental Biology*. Seibel continues work in ocean acidification, has funding for work on bioluminescence and has funding pending to investigate the effects of deep-sea mining on marine animals.

DR. AMELIA SHEVENELL (Paleoceanography/Paleoclimatology; Trace and minor elements in biogenic calcite and marine sediments; Stable isotopes in carbonate and siliceous marine microfossils; Lipid biomarkers; Sedimentology)

In 2020, Dr. Amelia Shevenell was awarded three grants from the National Science Foundation (NSF), including serving as PI on a three-year \$947,136 (USF Award: \$443,494) collaborative grant to study Antarctica's Miocene climate history from geochemical/micropaleontologic records in marine sediments recovered in 2018 from the Ross Sea by Shevenell, USF PhD candidate, Imogen Browne, and the Shipboard Scientific Party of the International Ocean Discovery Program (IODP) Expedition 374. The grant includes a Research Experiences for Undergraduates (REU) summer program to expand underrepresented minority participation in Antarctic Sciences. Also, in 2020, Dr. Shevenell's impact/notoriety in Paleoceanography and Antarctic Sciences was recognized by the National

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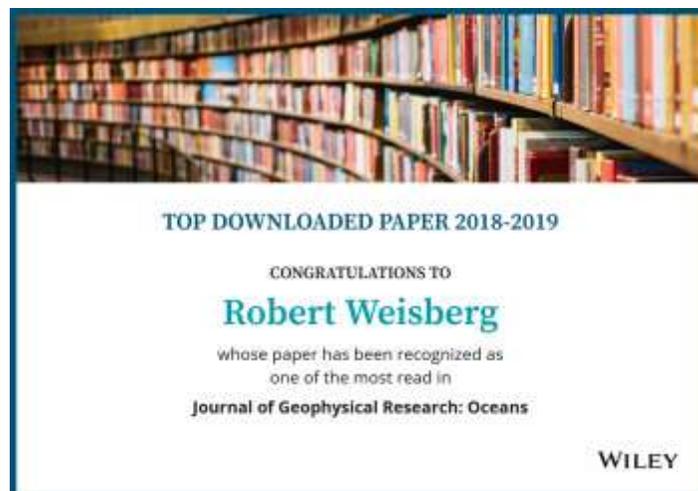
Academies of Sciences, Engineering, Medicine, when she was invited to serve on a committee to assess NSF Progress on the 2015 Strategic Vision for Antarctic and Southern Ocean Research. Dr. Shevenell and collaborators published five papers, with 4 additional papers accepted/in review in high-profile journals. Two of Dr. Shevenell's PhD students defended their dissertations in 2020 and will graduate in Spring 2021. Her MS student defended her MS research, graduated, and is now employed as a program assistant at NSF. In addition to research and teaching commitments, Dr. Shevenell is the Geological Oceanographer Councilor to The Oceanography Society's governance council and a member of their Ethics Committee. Dr. Shevenell serves as an Associate Editor for *Paleoceanography and Paleoclimatology*, the premier journal in her subfield and served as Associate Editor for a NSF-funded special *Oceanography* issue, entitled *Paleoceanography: Lessons for a changing world*, published in 2020.

DR. CHRIS STALLINGS (Ecology; Marine conservation and management efforts)

Dr. Stallings and his lab had an active and productive 2020. With a large lab of eight graduate students, they addressed a number of questions along several research themes. These included 1) identifying patterns and processes of ecological communities across different spatial and temporal scales, including how they are responding to climate change and to the covid-19 induced reductions in global human activities, 2) habitat restoration outcomes and mechanisms affecting key foundation species (e.g., corals, oysters), 3) the effects of different pollutants (i.e., microplastics, mosquito larvicides) on estuarine and coastal species, and 4) the use of stable isotope analysis to understand food-web architecture and lifetime-level movements of fishes (e.g., bluefin tuna, hogfish, invasive lionfish). This work has implications across local (Tampa Bay), regional (Gulf of Mexico), and global scales to inform aspects of both basic ecological research and application for management and conservation.

DR. ROBERT WEISBERG (Ocean Circulation; Ocean-Atmosphere Interaction Studies in the Tropics; and West Florida Continental Shelf Circulation)

Gratifying this year was an award on 4/30/20 for Weisberg et al. (2019) being among the top 10% downloaded papers in JGR-Oceans in the 12 months following publication.



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Along with furthering my research agenda, my concentration this year was on my four students, ensuring that each is progressing along a productive PhD dissertation track. J. Chen is completing his dissertation on the production and application of a very high resolution nowcast/forecast circulation model for Tampa Bay. A. Nickerson is completing two papers, one on climate variations for the region, the other on the mechanism for Loop Current eddy shedding and whether (or not) this will result in WFS adherence at the pressure point. He is also exploring new concepts for Hurricane formation. L. Sorinas is exploring the scale of the inner shelf and sensitivities to friction and bottom slope, building upon my group's prior work. J. Law is updating long-term means and seasonal variations in WFS circulations, now based on two decades of observations made by my group. He will then attempt to draw distinctions between shelf wave concepts and frictional boundary layer responses of the WFS to remote and local forcing.

DR. NANCY WILLIAMS (Ocean Carbon Cycle, Carbonate Chemistry, Ocean Biogeochemistry, Ocean Acidification, Earth System Modeling, Autonomous Platforms)

During her first full year as an Assistant Professor at USF CMS, Dr. Williams has made significant progress towards building up her research program despite the ongoing COVID-19 global pandemic. Her first lead NSF proposal for ~\$1.1M has been recommended for funding and she was coauthor of a publication in the prestigious journal *Nature Geoscience* which was highlighted in the journal's *News and Views*. Dr. Williams has also continued several collaborations in the global ocean carbon community, participating in several working groups aimed at improving observations and estimates of the ocean and global carbon budget. Dr. Williams recruited her first MS student, Nicola Guisewhite, who is currently completing her first-year coursework and making progress on her research studying the air-sea fluxes of carbon dioxide in an oceanic eddy in the Southern Ocean using autonomous biogeochemical sensors which were deployed on a Saildrone and profiling floats. Dr. Williams is also working with CMS Ocean Technology group to equip a glider with a new pH sensor which will be used to study carbon cycling and ecosystem health in the Gulf of Mexico.

CMS OCEAN TECHNOLOGY GROUP:

The CMS Ocean Technology (COT) group was involved in a number of high-profile projects this past year despite the challenges presented by COVID. We are very proud of what they have accomplished.

This was a banner year for the glider deployments despite the challenges of doing field work during a pandemic. Our glider crew accomplished great things under extremely difficult conditions:

- Four east coast glider deployments supporting SECOORA's Hurricane glider work.
- Five West Florida Shelf glider deployments for the State of Florida and GCOOS.
- Procured a new glider with new nutrient capabilities for the eastern Gulf of Mexico. Deployment scheduled the summer of 2021.
- Contributed to three 5-year grants from SECOORA, GCOOS, and the State of Florida.

The COT achievements were not just limited to glider work, and all of these efforts were also challenged by COVID. Our COT people need to be in the field, and they are to commended for getting the work done:

FACULTY HIGHLIGHTS

- The Geo-Buoy collaboration with Professor Dixon from Geosciences has been very successful, resulting in a new successful 2-year proposal.
- The seafloor sonar and video mapping projects for the past 5 years were leveraged to help win a new center with NOAA, the Center for Ocean Mapping and Integrated Technologies (COMIT) funded at \$9 M for the next 5 years.
- We have been funded in a collaboration with FAU/FWRI for an exploratory new red tide research method for one year, with hopes of more funding coming next year. Early results are promising.
- COT developed a new first-ever method for transmitting glider based echo sounder data via satellites that allows us to get real-time data about fish distribution through the water column.
- COT supported observing systems in the Gulf of Mexico, including participation in several cruises and service visits. We integrated a new multi-parameter meteorological instrument into three buoy platforms, incorporated upgraded loggers and transmitters into two systems and provided technical support for CODAR power amplifier repairs.

RESEARCH FACULTY ANNUAL UPDATES:

DR. JOSHUA KILBORN

Dr. Joshua Kilborn's second year as Research Assistant Professor at the College of Marine Science has been productive. Dr. Kilborn helped to develop a framework and vision for implementing a next-generation, fishery ecosystem plan for the Gulf of Mexico large marine ecosystem, and contributed new and novel science to the region's fishery management council specific to the Greater Amberjack stock's dynamics. Additionally, Dr. Kilborn was invited to participate in the Gulf of Mexico Research Initiative's synthesis efforts, and which resulted in a 2020 publication co-authored with lead author Dr. Patrick Schwing (among others) called "*A synthesis of deep benthic faunal impacts and resilience following the Deepwater Horizon oil spill*". This work synthesized investigations conducted over the previous decade to describe community-wide vulnerability and resilience of biological resources associated with the deep-benthic system. The publication also added new community analyses, and updated previous works' results with contemporary data. The work is expected to be relatively high-impact and has already been viewed online > 1,800 times over the last 12-months. In addition to his research accomplishments, Dr. Kilborn also converted both of the programming and analysis courses that he instructs to the synchronous online delivery format, *and* redesigned the content to provide instruction using the open-source software language **R** and the **RStudio** programming interface. While the content delivery modifications were necessitated by the COVID-19 pandemic, the programming language changes were undertaken to increase the per-semester student enrollment levels, and the marketability of students' programming skills post-graduation.

MR. CHAD LEMBKE (Ocean technology and glider operations)

Mr. Chad Lembke attempts to specialize in enabling technology to be used for a diverse set of projects by managing and enabling personnel, coordinating and facilitating operations, and performing lab, field, maintenance, and facilities work as needed. In 2020 this resulted multiple successful research operations including:

FACULTY HIGHLIGHTS

- The conclusion of the large-scale habitat mapping project in collaboration with a team of up to 14 other staff and students. (<https://www.marine.usf.edu/scamp/index.php>). This project directly led to the successful bid for a new NOAA center now housed within CMS, the Center for Ocean Mapping and Innovative Technologies (COMIT) (<https://www.marine.usf.edu/comit/>)
- Expansion of the College's glider fleet and capabilities has been accomplished by adding three new gliders over the past several years. The newest glider is equipped with a SUNA nitrogen sensor that will be used in collaboration with other CMS researchers (KBuck, RWeisberg, & CHu) and FWRI partners as part of an expanding red tide research effort. In total the glider program has been funded by six federal and state grants over the past 24 months and has procured three 5-year grants in the past year.
- Continued support of the USF Geodesy buoy at the mouth of Tampa Bay which has resulted in a new grant allowing the movement of the existing buoy and creation of a second buoy to be deployed about 90 miles offshore. This buoy project was also instrumental in the procurement of the COMIT project.
- Maintenance and oversight of a large portion of COT infrastructure.

NONTENURE-TRACK FACULTY RESEARCH UPDATES

DR. BRIAN BARNES (Ocean Optics and Optical Remote Sensing)

Last year (2020), covid-19 presented many challenges, both personally and professionally. Thankfully, Dr. Barnes was able to continue working without overwhelming interruption. Dr. Barnes largely completed a multi-year effort to migrate our computing capabilities to the USF research computing cluster, which involved intensive work to develop software for lab members to use towards satellite data processing, as well as reprovisioning of our online data distribution system. He also took on a formal supervising role with the hiring of two postdocs (Min Xu and Shuai Zhang) and joined his first PhD student committee (Yingjun Zhang, USF). Research activities focused on a few projects which came to (or are nearing) completion, including (1) calibration of the long-near infrared band for ocean color retrievals, (2) developing water quality algorithms for support of seagrass health monitoring in Apalachee Bay, FL, and (3) development of a water quality based climactic indicator in the Great Lakes. Dr. Barnes also worked on three proposals, two of which were selected for funding, as well as numerous manuscripts, of which six were published.

DR. TERESA GREELY (Education and Outreach Director)

Dr. Greely and the Oceanography Camp for Girls were selected as 1 of 10 programs to participate in a national pilot launch of the Brite Program, a virtual STEM program, sponsored by the National Girls Collaborative Program. Participation in the Brite Program provided practice applying multiple virtual applications to deliver STEM education, as well as exceptional content. This experience helped to develop and launch the first virtual components of the Oceanography Camp for Girls (OCG). The pandemic presented an opportunity for Dr. Greely to re-envision the 29th annual Oceanography Camp for Girls. She and her team explored and developed virtual components of the program. Part 1 was a series of virtually delivered components, as monthly Saturday events from July 2020 through

FACULTY HIGHLIGHTS

February, 2021. Although the most immersive components of OCG, coastal field trips and research cruises, did not transfer to digital format, many components did and provided a tremendous opportunity to positively engage teenaged girls during a season of many cancelled events. Dr. Greely taught five classes this year. Her teaching evaluations ranged between 4.8-5.0 exceeding the College's average rating. These were encouraging results during the transition from in person classes to hybrid, and online delivery. Dr. Greely expanded partnerships and collaborations to include the Boys and Girls Club of the Gulfcoast through the Guardians of the Gulf program, St. Petersburg's Innovation District, and the College of Education's STEM Bootcamp and Robotics programs.

DR. YONGGANG LIU (Ocean Circulation; West Florida Continental Shelf Circulation)

Dr. Liu's work involves in all aspects of data analysis and coastal ocean modeling in USF/CMS Ocean Circulation Group. One of Dr. Liu's main efforts is to maintain our operational West Florida Coastal Ocean Model (WFCOM) & Tampa Bay Coastal Ocean Model (TBCOM, assisted with a graduate student) nowcast/forecast systems, as well as the related red tide short-term forecast products. Based on the output of the two models, they have further developed a tracking tool that can be used for rapid response in our coastal ocean, e.g., searching for missing glider if provided with last know location and time. Using the WFCOM tracer experiments, they investigated the termination process of the 2018 red tide and presented the findings in the 2020 AGU Fall Meeting (virtual). Efforts were also made in comparing the altimetry-derived surface current velocity with HF radar mapped radial currents in the Strait of Florida, and the results were reported in the 2020 OSTST virtual meeting. Dr. Liu's work directly contributed to several projects funded by NOAA/IOOS/SECOORA, NASEM, FWC/FWRI, GOMRI, etc. In 2020, Dr. Liu had four peer-reviewed papers published in 2020 (2 papers appeared in early 2021) and a book chapter to be published in 2021. Dr. Liu had nine presentations with published abstracts in national and international meetings. Dr. Liu also contributed to proposal writing, and acted as PI and Co-PI in three submitted proposals.

Dr. Liu served as a thesis committee member of two PhD students in USF/CMS, and sat on the thesis Panel of a PhD student at Deakin University, Australia. Dr. Liu regularly assisted Dr. Weisberg in advising several other graduate students in their research and studies. He frequently performs refereeing for a variety of journals (~30 times in 2020). Dr. Liu also served as an evaluator of the new operational forecast system (NGOFS2) for NOAA/NOS. According to Google Scholar, his *h*-index and *i10*-index are 33 and 55, respectively, showing his increasing impacts in academics. Dr. Liu was also actively involved in public outreach activities, volunteered at USF/CMS booth at Ocean Sciences Meetings, and acted as a Panelist in the Red Tide Forum hosted by Barrier Island Parks Society, Boca Grande, Florida.

DR. CLIFF MERZ (Ocean monitoring and prediction)

Dr. Merz is an ocean engineer, senior scientific research faculty member, elected government official, author, and inventor of sustainable marine water/food/energy nexus technologies. Dr. Merz is USF's Coastal Ocean Monitoring and Prediction System (COMPS) Program and Oceanographic Surface Current Measurement High Frequency Radar (HFR) Operations Director and is a 3-time elected commissioner (currently Vice-Mayor) of Pinellas County's City of Safety Harbor where he makes policy and budget decisions for 17,000+ residents with a \$68 million budget. Dr. Merz is a lead PI on a National Academy of Sciences, Engineering and Medicine's (NASEM) grant designed to better

FACULTY HIGHLIGHTS

understand the Gulf of Mexico's Loop Current. This multi-year, \$1,371,027, multi-institutional (sub awards to UM and Rutgers) effort, entails instrumenting specific locations within the lower Florida Keys with HFR systems and then observing the measured real-time surface current as it moves through the Florida Straits. In addition, Dr. Merz is Co-PI on several grants (HFR and Coastal Station) from the Southeast Coastal Ocean Observing Regional Association (SECOORA), part of the federal NOAA U.S. IOOS. Dr. Merz was elected into the August 2020 class of the National Academy of Inventors (NAI) class of senior members. NAI Senior Members are active faculty, scientists and administrators from NAI Member Institutions who have demonstrated remarkable innovation and produced technologies that have the potential for a significant impact on the welfare of society.

DR. ISABEL ROMERO (Organic chemistry and oil spill impacts)

Last year Dr. Romero worked on getting funding for 4 proposals, of which two were rejected. Dr. Romero expects to hear about the other two proposals within the next couple of months. Proposals ranged from characterizing chemically deep-sea sediments to mesopelagic communities and interaction between surface and deep-sea communities. Related to scientific publications, 6 manuscripts were published and 3 more are in review at the moment. Also, results were presented in 3 different scientific meetings in person (GOMOSES, Tampa; Oceans Sciences, San Diego) and virtually (Goldschmidt, Hawaii).

In addition to the research conducted during 2020, Dr. Romero is part of the committee of 3 master students. Dr. Romero has been mentoring Thea Bartlett in her thesis. Also, Dr. Romero is helping Lisa Rose-Mann formulate an outline for the chemistry section of her thesis work. Some professional services include reviewing manuscripts and a conference session chaired (GOMOSES 2020).

DR. KARYNA ROSARIO (Genomics; Marine Microbiology; Wastewater Microbiology; and Virology)

Although, like many others, Dr. Rosario was not able to be in the lab for most of 2020, her research and collaborative efforts resulted in three peer-reviewed publications. Dr. Rosario also continued to assist graduate students in Dr. Mya Breitbart's lab with their projects and shared her research through two invited talks and a poster presentation at an international conference. Dr. Rosario is learning to embrace advantages of virtual interactions, such as 'distance is not an issue', and started training an undergraduate student in India, Akash Dutta. Akash is learning how to analyze viral genomes using bioinformatic tools while helping out with a project investigating viruses in freshwater springs here in Florida.

Groups interested in finding viruses in their systems continue to seek out Dr. Rosario's expertise in virus detection and discovery allowing her to establish various collaborations, including:

- Dr. Nolwenn Dheilly (Stony Brook University): Dr. Rosario continued to collaborate with Dr. Dheilly to investigate parasite-associated viruses. This collaboration, alongside Dr. Dheilly's PhD student Megan Hahn, resulted in a peer-reviewed publication describing viruses associated with a parasite whose complex life cycle includes copepods, fish, and fish-eating birds as hosts. Dr. Rosario was also a dissertation committee member for Dr. Hahn, who successfully defended and graduated during Summer 2020.

FACULTY HIGHLIGHTS

- Dr. Walter Betancourt (University of Arizona): Dr. Rosario continues to collaborate with Dr. Betancourt to investigate viruses found in wastewater and how these viruses might be used to track wastewater treatment efficiency.
- Dr. Jose Ramirez (USDA Agricultural Research Service): Dr. Rosario established new collaboration with Dr. Ramirez and his post-doc Kristin Duffield from the USDA to investigate viruses affecting cricket populations.

Finally, Dr. Rosario collaborated with editors from Futurum Careers (<https://futurumcareers.com>) to create a non-technical and free educational article and science activity based on Dr. Rosario's research and experiences in marine science (see <https://futurumcareers.com/a-virus-that-can-actually-save-us-from-harm>). Futurum Careers is an open access resource and magazine aimed at encouraging youth worldwide to pursue careers in STEM fields.

DR. YUNFANG SUN (Dynamics of coupled oceanic-atmospheric modeling, Estuary and coastal ocean processes)

Dr. Sun has developed a new high-resolution West Florida Shelf FVCOM ocean model (WFCOM), including the SST data assimilation, the highest resolution reaches 50 m at the coastal region, and the open boundary condition is multiple layers nested with HYCOM. The new WFCOM is then validated with NOAA tides and currents observation. Based on the new WFCOM, a wave-current interaction is also developed to simulate the wave.

Other Events and Highlights

ALUMNI HIGHLIGHTS

In 2019 the Communications team started an effort to better track the successes of CMS alums and to share those in a Q&A story format.

Notable alum stories tracked in 2020 include:

- A Q&A with Dr. Jyotika Virmani, Class of 2005, <https://www.usf.edu/marine-science/news/2020/a-q-and-a-with-alum-dr-jyotika-virmani.aspx>. Virmani is the first Executive Director of the prestigious Schmidt Ocean Institute.
- A Q&A with Dr. David Palandro, Class of 2006, <https://www.usf.edu/marine-science/news/2020/a-q-and-a-with-alum-dr-david-palandro.aspx>. Palandro's role as Senior Aquatic & Marine Environmental Advisor for ExxonMobil has taken him to more than 50 countries on six continents in the last nine years.

Facilities

Major projects that were completed in 2020 included Phase 2 of the replacement and upgrade of the KRC fire alarm system; the reconfiguration and upgrade of HVAC service for MSL 223C & D; and the remodel of Geology space in MSL into a Geophysics lab for a new faculty member. The lab remodel project also included the installation of fire sprinklers in an additional 9000 ft² of first floor space, and long overdue maintenance and repairs of ductwork, controls and system components of AHUs 9 & 10 which service the new lab and adjacent spaces.

Numerous minor projects were also completed throughout the year including the remodel of MSL offices 221A, 210B and 222C (paint, flooring, electrical); the reconfiguration of CWS/R piping for FCU-17 (MSL 152); the removal of the remaining two COT trailer units; floor replacement in the MSL NE entryway; and the replacement of two termite-damaged doors on MSL 2nd floor custodial closets.

Education and Outreach

CMS EDUCATION AND OUTREACH PROGRAMS

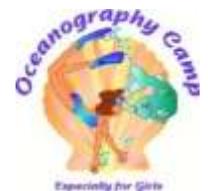
Teresa Greely led the college's education and outreach (E&O) programs in support of the USF mission for community engagement. The accomplishments in E&O reflect a diversity of programs and events that have advanced ocean literacy and research amongst K-12 teachers and their students, undergraduate and graduate students, as well as collaborations with scientist and community agencies. This was a unique year during a pandemic. The global shutdown provided challenges and opportunities to deliver programming virtually.

The Spoonbill Ocean Sciences Bowl. Springtime E&O team hosted the 16th annual academic brain bowl with 170 participants, including 110 high school students and teachers from across West Florida. Sixty volunteers, both returning and new, represented the Eckerd College, FMSEA, FWC, New College, NOAA, Ocean Optics, USGS, USFSP, and USF Marine Science. Congratulations to Gainesville 4-H team led by coaches who were two former Spoonbill competitors. Gainesville 4-H represented the Spoonbill



Bowl in the NOSB Finals.

The Oceanography Camp for Girls. Summertime was the **29th year for the OCG**. Our pre-college STEM program continued to encourage teens to consider careers in the sciences while developing a positive sense of self, science, and the environment. More than **1200 teenaged girls have completed the 3-week program, with 28 girls participating this past summer**. Graduate and undergraduate students served as science mentors with professional staff, and participating scientists from FWCC, USGS, NOAA and USF Marine Science. During our 2020 virtual OCG events, we introduced our first Blue Economy component that featured where young ladies' lives intersect with the Blue Economy in the Tampa Bay region. We highlighted technology and concepts in three sectors: ships use of smart shipping to lessen the impact on the environment; creates jobs, reduces poverty and ends hunger; based on sustainable fisheries; and, and harnesses renewable energy. The Zoom breakout rooms were abuzz with creative ideas as young ladies were challenged to find themselves in this larger intersection of oceanography and the economy.



EDUCATION AND OUTREACH



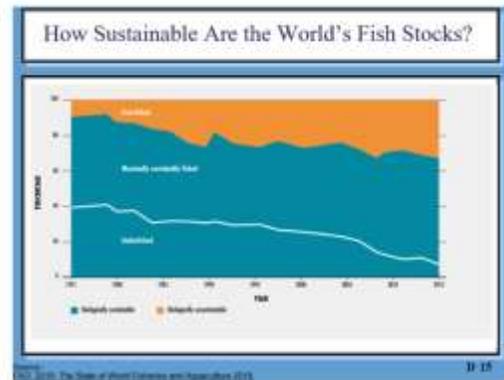
December Stewardship & Coastal Cleanup



Throughout the month of December, we challenged campers to collect trash in a coastal environment. They collected over 300 pounds of trash, including 89 cigarette butts, 74 foam pieces, 70 bottle caps, wood planks, footwear and construction materials.

January Fisheries Management

To kick off the new year, campers competed to become the best fishing company with a virtual game called Fish Banks. They created their own marketing strategy, purchased fishing boats, and learned how a fishery can be crashed by overfishing.



EDUCATION AND OUTREACH

As a NOAA Ocean Explorer facilitator, Greely led a series of Teacher Professional Development opportunities. Springtime Florida teachers learned 'How We Explore, and Why We Explore the Oceans' in partnership with NOAA Office of Ocean Exploration and Research and National Marine Sanctuaries Foundation. NOAA OER strives to engage broad audiences to enhance America's environmental literacy through the excitement of ocean discovery following the NOAA Ship *Okeanos Explorer*. Participants learned about the importance of ocean exploration and the advanced technological capabilities used to explore the deep ocean. Educators received standards-based, hands-on activities and online resources to guide classroom teaching and learning. A total of 32 educators completed the *Exploring the Deep Ocean with NOAA* 7-hour professional development. Fall programs were canceled due to the pandemic.



"It helped provide resources relating material to daily life for students."

"Excellent, very informative... Thank YOU!"

"Live stream with Okeanos was wonderful!"

Paying It Forward: OCG Alumni made waves by paving the path for future online STEM programs for teens

Summertime OCG outreach was LIVE through the virtual world. CMS Oceanography Camp for Girls alums spent three-weeks in the pilot program, Brite a bold, interdisciplinary summer STEM learning program built especially for girls 13-16. Collaborators included World Science Festival, the National Girls Collaborative Project, and the Hello Studios. Teens selected for the Brite program included ten Oceanography Camp alumni who informed and paved the path for future online STEM programs. Brite consisted of three new courses that explored unique topics, such as the intersection of art and science, the strategies of women working with dangerous creatures, and the challenges of conducting experiments on the human brain.



OCG Alumni, Abby A shared. "Brite fest was so much fun and my favorite part was coding dances. I learned from our speaker (Yamilée Toussaint Beach) that you don't just have to choose one career path. More often than not, different career paths intertwine, allowing you to have both and not have to choose between two. Art and science intertwine in my life.

Other Education & Outreach included:

- Taught undergraduate ocean science courses for the USFSP Honors College
- 10 community education events at the Clam Bayou Marine Education Center
- Broader Impact components & implementation plans for CMS and CoEd proposals and grants

Communications

STRATEGIC COMMUNICATIONS UPDATE

Communications Team. CMS alum Kristen Kusek ('98) serves as Director of Strategic Communications and has managed the communications team since the fall of 2018. The team currently includes webmaster Jay Novitzke (full time) and assistant and graduate student Carlyn Scott (10 hours/week; started Fall 2020). Prior to Carlyn, our assistant was graduate student Carey Schafer, who worked 20 hours a week through the summer of 2020 (ended Aug 31, 2020).

2020 Highlights and Challenges. A top achievement in 2020 was migrating our website from Wordpress (marine.usf.edu) to a new content management system for USF called OU Campus (usf.edu/marine-science). This was a required part of the OneUSF consolidation effort. We met the challenge ahead of deadline and continued a solid record of story content generation and media coverage of the tremendous research going on at the CMS -- showing steady growth across all social media metrics. We also developed and launched innovative web elements to increase engagement with our audience during a radically unusual year due to the coronavirus pandemic. Capacity remains a top challenge. As noted above, we experienced a capacity loss in 2020. In addition, the web migration process, with new protocols in place, means that our webmaster no longer has access to our website code, which has been for us a net loss in capacity and productivity (it takes longer to post stories/content, fix glitches). We have expressed concern about this significant change (and net productivity loss), and are working in partnership with the UCM web development team.

What follows is a snapshot of key highlights from 2020, broken down into the following categories: GENERAL, MEDIA OUTREACH, WEBSITE, AUDIENCE ENGAGEMENT: SOCIAL MEDIA & NEWSLETTER, STEAM EDUCATION PROGRAM DEVELOPMENT, and OTHER.

GENERAL

- Built new partnerships across campus as part of OneUSF / consolidation initiative (e.g., Kusek now joins USF St. Petersburg campus weekly MarComm meetings, weekly COVID-related meetings led by USF Tampa campus and University Communications & Marketing (UCM))
- Continued to innovate new ways to engage our audience:
 - Launched ArcGIS map showcasing CMS research, <https://storymaps.arcgis.com/stories/725afd61b4d44c56a8af168485657846>
 - Launched 360 tour of CMS campus thanks to a partnership with Future Vision Media who provided VR/360 production support, <https://www.usf.edu/marine-science/education/prospective-students/index.aspx>
 - Produced first multimedia stories:
 - A Grand Challenge that Rivals the Rising Seas: Creating a Culture of Diversity in Ocean Science (see <https://www.usf.edu/marine-science/news/2020/a-grand-challenge-that-rivals-rising-seas-creating-a-culture-of-diversity-in-ocean-science.aspx> and <https://spark.adobe.com/page/21TnjEuyriFU/>)

- In Perfect Isolation (see <https://www.usf.edu/marine-science/news/2020/in-perfect-isolation.aspx> and <https://spark.adobe.com/page/TaU9Z7gnuTO40/>)
- Continued to strategize cost-effective ways to increase our capacity. For example, we harness the talent of graduate students interested in improving their communications skills who contribute blogs or perspective pieces while receiving communications training in return (See, for example, a blog post by PhD student Ellie Hudson-Heck (<https://www.usf.edu/marine-science/news/2020/its-not-just-the-ocean-are-rivers-also-at-risk-from-climate-change.aspx>) and staff member Makenzie Burrows, (<https://www.usf.edu/marine-science/news/2020/a-scavenger-egg-hunt-in-the-gulf-of-mexico.aspx>).
- Continued to operationalize our communications function and implement data-driven procedures and QC protocols.

MEDIA OUTREACH

- Partnered with USF's University Communications & Marketing (UCM) to execute press strategy around 10-year wrap-up of historic Deepwater Horizon oil spill. See, for example, <https://www.usf.edu/news/2020/gomri-conference.aspx>.
- Developed and executed media strategy for the Underwater Minerals Conference 2020, hosted by the CMS, which is also the new home for the International Marine Minerals Society (IMMS). See, for example, our CMS story (<https://www.usf.edu/marine-science/news/2020/usf-college-of-marine-science-becomes-home-for-international-marine-minerals-society.aspx>) and the story covered by the Tampa Bay Times (<https://www.tampabay.com/news/environment/2020/10/08/to-fight-climate-change-should-we-mine-the-deep-sea-usf-wants-to-find-out/>)
- Press releases:
 - April 2020: Oil Toxins Pervasive in Gulf of Mexico, <https://www.usf.edu/marine-science/news/2020/oil-toxins-pervasive-in-gulf-of-mexico.aspx>
 - Oct 2020: City of St. Petersburg supports USF efforts to further enhance diversity with new pledge to College of Marine Science, <https://www.usf.edu/marine-science/news/2020/city-of-st-petersburg-supports-usf-efforts-to-further-enhance-diversity-with-new-pledge-to-college-of-marine-science.aspx>
 - Oct 2020: USF and NOAA to launch world-class cooperative ocean mapping center, <https://www.usf.edu/marine-science/news/2020/usf-and-noaa-to-launch-world-class-cooperative-ocean-mapping-center.aspx>
- Stories that generated press coverage (not press releases):
 - In Perfect Isolation (<https://www.usf.edu/marine-science/news/2020/in-perfect-isolation.aspx>)
 - USF Partner in Costa Rica Launches the Country's First Program to Detect Coronavirus in Wastewater (<https://www.usf.edu/marine-science/news/2020/usf-partner-in-costa-rica-launches-the-countrys-first-program-to-detect-coronavirus-in-wastewater.aspx>)

- A New, Fast Way to Analyze Hurricane Damage to Coastal Environments (<https://www.usf.edu/marine-science/news/2020/a-new-fast-way-to-analyze-hurricane-damage-to-coastal-environments.aspx>)
- Scientists Conduct First Census of Viruses and Bacteria Living in Florida Springs (<https://www.usf.edu/marine-science/news/2020/scientists-conduct-first-census-of-viruses-and-bacteria-living-in-florida-springs.aspx>)
- eDNA Used to Track Marine Biodiversity Over Time in a Research First (<https://www.usf.edu/marine-science/news/2020/edna-used-to-track-marine-biodiversity-over-time-in-a-research-first.aspx>)
- Continued to improve media outreach, including the bolstering of relationships with media teams across USF. Many of our stories are now featured on the main usf.edu website, which improves our engagement and outreach overall.
- Some of the most significant media coverage (see list below) was in response to the wrap up of the Deepwater Horizon oil spill project, C-IMAGE, announced in April. Another highlight was in response to Dr. Ali Graham's work in Antarctica. See Appendix C for a complete list of 2020 media coverage.

4/14/2020, **Scientists have found oil from the Deepwater Horizon blowout in fishes' livers and on the deep ocean floor**, <https://news.yahoo.com/scientists-found-oil-deepwater-horizon-121627958.html>

4/15/2020, **USF researchers sampled more than 2,000 fish in the Gulf of Mexico. They found oil pollution in every one.**, https://www.tampabay.com/news/environment/2020/04/15/usf-researchers-sampled-more-than-2000-fish-in-the-gulf-of-mexico-they-found-oil-pollution-in-every-one/?ads=b&utm_expid=.OkR8_rI9TJCniE4SYU689w.2&utm_referrer=

4/15/2020, **Survey shows pollution in Gulf 10 years after Deepwater Horizon spill**, https://www.upi.com/Science_News/2020/04/15/Survey-shows-pollution-in-Gulf-10-years-after-Deepwater-Horizon-spill/3221586965019/?ur3=1

4/20/2020, **10 years after the Deepwater Horizon oil spill, oil pollution found in thousands of fish, study says**, <https://www.cnn.com/2020/04/20/world/deepwater-horizon-spill-anniversary-fish-study-scn/index.html>

4/20/2020, **Sparkling waters hide some lasting harm from 2010 oil spill**, AP pick up, <https://abcnews.go.com/Business/wireStory/sparkling-waters-hide-lasting-harm-2010-oil-spill-70236604>

5/28/2020, **Ancient Antarctic Ice Sheet Loss Dwarfs Modern Melting, Study Finds**, <https://earther.gizmodo.com/ancient-antarctic-ice-sheet-loss-dwarfs-modern-melting-1843732617>

5/29/2020, **Climate change: 'Stunning' seafloor ridges record Antarctic retreat**, <https://www.bbc.com/news/science-environment-52845990>

COMMUNICATIONS

WEBSITE (current – www.usf.edu/marine-science; legacy site – www.marine.usf.edu)

- Hit USF deadline of July 1 for website migration to a new content management system. Includes complete web redesign. We continue the work of story-related content migration and are tracking functionality improvements and declines. (We experienced a net loss of website functionality in 2020 due to the migration.)
- Developed new Glider fleet webpages (<https://www.usf.edu/marine-science/research/partners-and-groups/cms-ocean-technology-group/the-usf-glider-fleet/index.aspx>)
- Overall in 2020, we experienced a -11.39% decline in the number of unique monthly visitors to the CMS website. This is an expected result due to the website migration in July 2020.

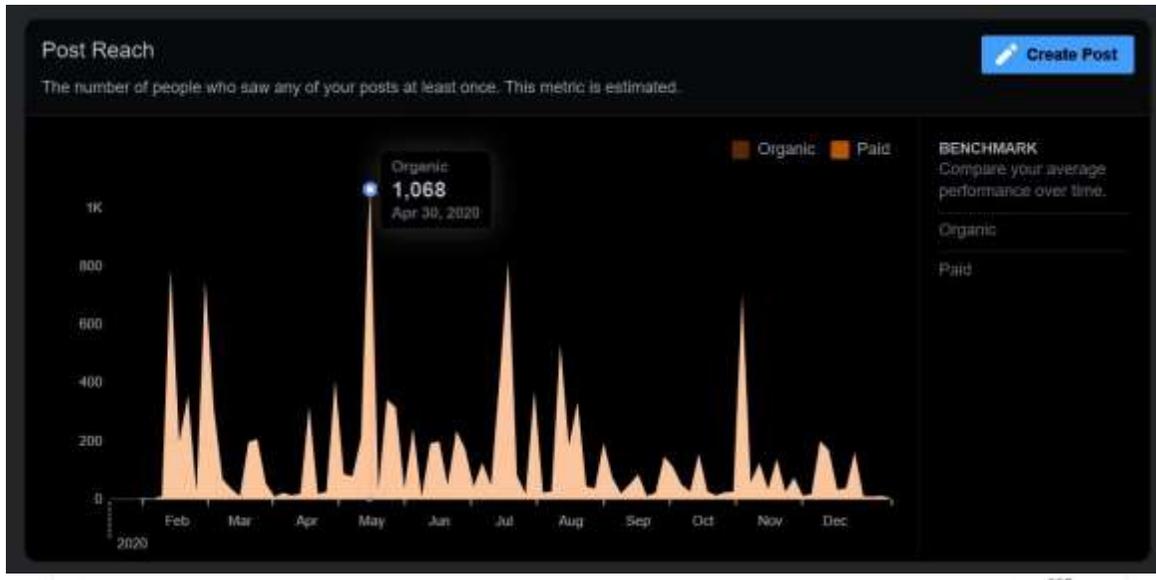
ENGAGEMENT: SOCIAL MEDIA (Facebook.com/USFMarineScience, Twitter.com/USFCMS, Youtube.com/USFMarineScience, Instagram.com/usfmarinescience)

- Achieved 6.9% growth in Facebook community over prior year.
- Achieved 18.6% growth in Twitter community over prior year.
- Launched Instagram in 2019 (Primary goal: increase engagement with prospective students). Achieved 108.2% growth in 2020.
- Achieved 26.4% growth in YouTube community over prior year.

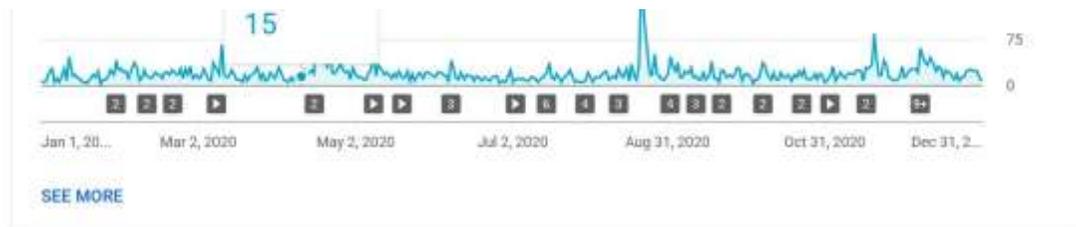
Audience Engagement

	Website	Facebook	Twitter	YouTube	Insta
2018	43,422	1400	No Data	No Data	N/A
2019	59,199	1726	1880	280	256
2020	52,452	1845	2230	354	533

*Facebook and Twitter were launched in December 2012.



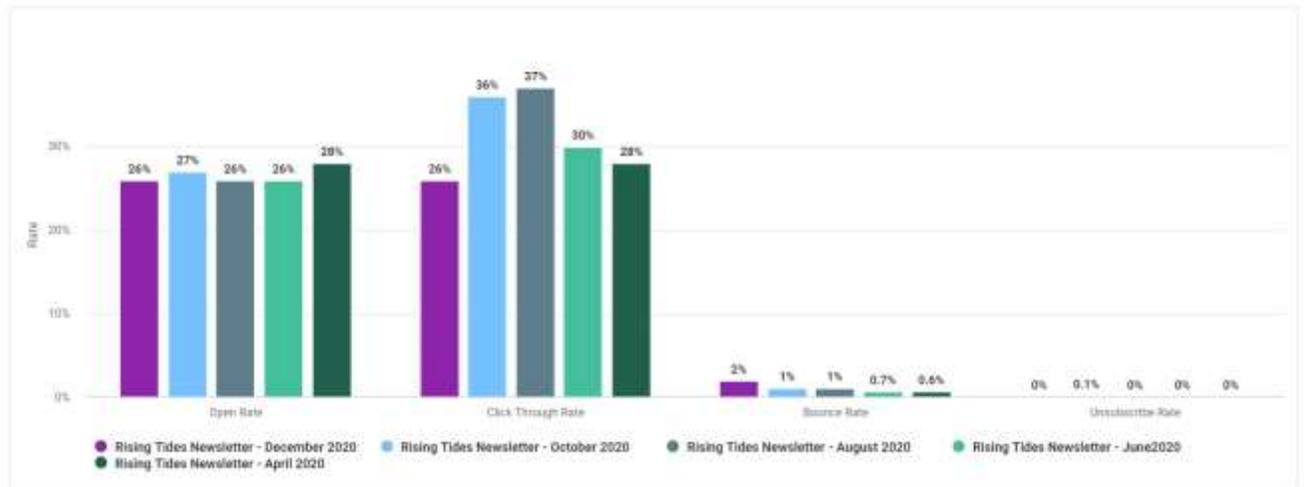
1 Post Reach on Facebook throughout 2020.



Overview of YouTube channel analytics throughout 2020.

ENGAGEMENT: NEWSLETTER

- We re-designed and re-launched the “Rising Tides” newsletter in October 2019 and continued to deploy it every other month. Our aim is to deploy it monthly but we are limited in staff capacity.
- Highlights from the graph below: We continue to show solid engagement metrics compared to industry standards, and that’s a solid unsubscribe rate (0%).
- One main challenge we continue to face is in the quality of our email lists, which we are working on in partnership with Doug Myhre. One goal is to do much more strategic and targeted engagement with our audience (e.g., alum-specific emails) but currently lack the capacity to move this forward.



Graph showing Campaign Comparison Report of last five newsletter campaigns in 2020.

STEAM EDUCATION PROGRAM DEVELOPMENT

Kusek leads CMS's newest STEAM program focused on coastal resiliency called **Guardians of the Gulf**. USF colleagues include Sarah Grasty (COMIT, education lead) and Teresa Greely. The program is a partnership with the Boys & Girls Club of the Suncoast. It is a pilot program of the St. Petersburg Innovation District's 'smart city' initiative that has already leveraged about \$20,000 in start-up funds (\$10k from IGNITE, \$10k from Duke Energy Foundation). Additional program partners include the St. Petersburg Innovation District, the city of St. Petersburg, St. Petersburg College, USF St. Petersburg, Spectrum (Charter Communications), and U.S. Ignite. From the CMS side, Kusek recruited help to fully develop the program model from fellow CMS staff and alums, Sarah Grasty and Dr. Teresa Greely.

2020 achievements include the following:

- Won IDC Smart Cities North America national award in the sustainable infrastructure category, covered in this news story: <https://stpetecatalyst.com/marine-education-project-from-innovation-district-usf-boys-girls-clubs-wins-smart-cities-award/>
- Planned but had to delay Pilot launch funded by Duke Energy Foundation due to COVID-19 (was supposed to run March 2020 spring break).
- Secured Tampa Bay Estuary Program Mini-grant (\$2000) to develop 2 Activity booklets
- Secured ~\$3500 from individual donors in partnership with Development; funding will be used to develop STEAM workforce-related videos
- Submitted as part of NSF CoPe (\$2.6 million over 5 years): TBD
- Submitted NSF AISL (\$298,000 over 2 years): TBD
- Expanded cross disciplinary partners across USF campuses (including Tampa and St. Petersburg campuses)
- Unsuccessful grant submissions that nonetheless propel us forward: Submitted \$500,000 NOAA Environmental Literacy program after successful first round (We were in top 46 of 189 proposals submitted) in March 2020; SECOORA proposal for \$8500 (not successful due to

technicality in proposal submission but named a finalist); Submitted Ford Foundation grant for \$25,000 (not successful)

OTHER

- Contributed science communication element to the CMS NSF REU program for 2021 (led by David Naar, Ana Arellano)
- Kusek delivered four guest lectures on science communication:
 - Jan 2020: Ocean Policy (Mark Luther, Frank Muller-Karger)
 - Feb 2020: Feature writing (Mark Walters, Digital Comm/Journalism program)
 - April 2020: Scientific Writing (Pam Muller)
 - Oct 2020: Professional Development (Mya Breitbart, Kristen Buck)

Development Updates

FUNDRAISING

While the pandemic brought its share of challenges this past year, the College of Marine Science continued to receive generous support from alumni, faculty and staff, friends and community partners through current and deferred gifts, and in-kind donations.

This year, the College of Marine Science received a \$3 million gift from the estate of Mrs. Anne Von Rosenstiel. This transformational gift will be divided between two existing endowments established by Anne and Werner Von Rosenstiel: the Anne and Werner Von Rosenstiel Fellowship in Marine Science and the Von Rosenstiel Innovation Fund for Marine Science. Since the Anne and Werner Von Rosenstiel Fellowship was established in 1993, more than 80 of our students have received these prestigious awards. We are most grateful to the Von Rosenstiels for their generosity to the college over the course of more than thirty years.

The City of St. Petersburg made a generous commitment of \$125,000 to the college to help enhance diversity in the ocean sciences. This gift to the “Bridge to the Doctorate” fellowship endowment supports underrepresented students of color, and aligns with the City’s Grow Smarter initiative, which includes a spectrum of equity-focused investments. It complements USF’s broader portfolio of diversity-focused initiatives, commitment to equity in education, and its track record of student success.

The St. Petersburg Downtown Partnership made a gift of \$50,000 to support a new fellowship established by Drs. Peter and Susan Betzer, the Norman Blake Endowed Memorial Fellowship in Marine Science, which was awarded for the first time in 2020. The Norman Blake Fellowship supports fulltime graduate students in the College of Marine Science with a preference for those studying shellfish biology, shellfish aquaculture or benthic invertebrate ecology.

Dr. and Mrs. Hogarth’s generous legacy gift will enhance the William T. Hogarth Fellowship in Marine Mammals, which was established in 2008. The Hogarth Fellowship is awarded annually to a biological oceanography student. Special consideration is given to students enrolled in Marine Resource Assessment whose research is focused on fisheries or marine mammals.

In honor of his former advisor, E. Howard Rutherford, along with his partner Mark Felix established the Kent A. Fanning Endowed Fellowship in Marine Science to benefit students focusing on Marine Geochemistry. Dr. and Mrs. Fanning made a most generous blended gift to augment and endow the fund which will be awarded for the first time in the fall semester of 2021.

Fellowships

Thanks to the ongoing support of our sponsors Duke Energy, Biltmore Construction, Harvard Jolly, and Willis Smith Construction, we recognized our fellowship and award recipients and their supporters at the annual College of Marine Science Fellowships and Awards Celebration in October of 2020. The event was held in a virtual format, with each student giving a brief video overview of their research.

DEVELOPMENT UPDATES

The keynote speaker was Kelly Vasbinder, recipient of the William and Elsie Knight Endowed Fellowship in Marine Science. When Kelly was 14, she attended the Oceanography Camp for Girls program, and decided that very summer to pursue a career in marine science. In 2020, she received her PhD in Marine Resource Assessment from USF and began a post-doctoral position at University of California Santa Cruz.

The college's \$20M endowment provided ~\$368,500 for endowed fellowships and awards to 29 CMS graduate students in 2019-2020. The 2020 Fellowship and Awards Celebration featured the inaugural award of the Norman Blake Endowed Memorial Fellowship in Marine Science, mentioned above.

For a list of the esteemed winners of the 2020 fellowships and awards, please see the Graduate Program section under the heading "2020 CMS Student Fellowships & Awards within CMS," on page 14 of the Annual Report.

FUNDING PRIORITIES

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:

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.

Dean's Innovation Endowment for Research Support: To recruit and retain top caliber faculty, significant resources are 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. Our \$20M endowment provides fellowship support for approximately 30 graduate students each year. To stay competitive, we must continue to attract new fellowship support, and also increase the value of many of our existing fellowship endowments.

Unrestricted Gifts: These gifts are a powerful form of private support because they allow for flexibility in addressing education and research opportunities and challenges that affect both the college and the community. As we learned in 2021, when fast-breaking, unforeseen environmental crises strike such as the Piney Point phosphate discharge into Tampa Bay, researchers in the college will be able to use unrestricted funds to act in a timely manner and provide the science necessary to inform an effective response.

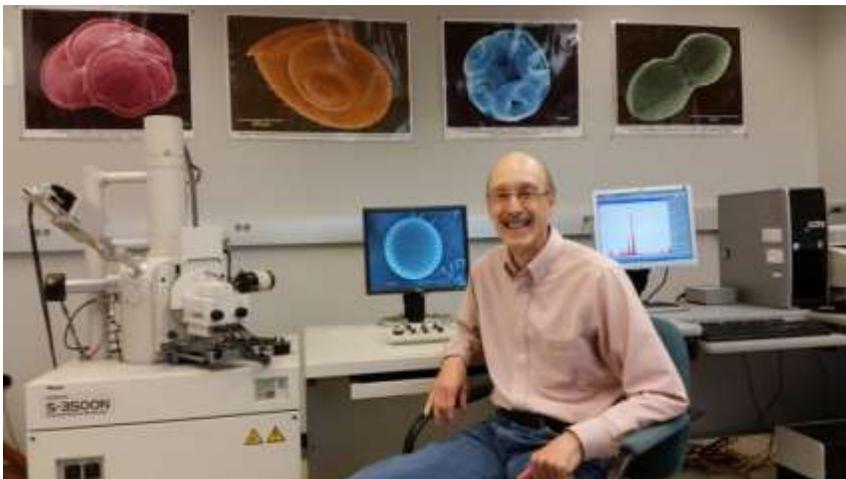
Retirees

Tony Greco, Electron Microscope Manager

College of Marine Science

Years of Service – 1980-2020

Tony's 40 years of experience in electron microscopy have brought a wealth of knowledge to our student education and research endeavors. Tony facilitated decades of research at CMS encompassing a wide variety of oceanographic disciplines – with projects examining the ultrastructure of bleached foraminifera in response to ultraviolet rays in sunlight, high resolution imaging of marine viruses and the sizing and chemical classification of African and Saharan dust particles. For many years, Tony taught formal courses in Scanning and Transmission Electron Microscopy, where students learned the theory and techniques of electron microscopy and gained hands-on training in specimen preparation and instrument operation. In addition to his many education and research impacts, Tony performed a tremendous amount of service in the college and the community. He managed the chemical deliveries, chaired the CMS Safety committee, and cheerfully encouraged interdisciplinary communication through organizing our Friday “morning munchies” (where his coffee cake was a bit hit!). Tony gave countless laboratory tours for prospective students and donors, and ran a wildly popular booth at the annual Saint Petersburg Science Festival showing 3D images of tiny ocean critters. Throughout his career, Tony consistently went above-and-beyond to facilitate learning, research, and access to advanced technologies – we wish him the best in his retirement and will miss him greatly!



Obituaries

David Hollander, Ph.D. (1959-2020)

Our beloved colleague and friend David J. Hollander passed away unexpectedly at his home in Gulfport, FL on September 26th, from complications of COPD. At the time of his death, David was a Professor of Marine Geochemistry at the University of South Florida College of Marine Science. Born in New York City in 1959, he was 61 at the time of his passing.

Dr. Hollander received his B.S. degree in Chemistry with a specialization in Earth Sciences from the University of California San Diego where he studied at the Scripps Institution of Oceanography. His M.S. degree from the University of California Santa Cruz was in Earth Sciences and would set him on a path of understanding the history of the planet and its changes by studying the geochemistry of the sedimentary record. David would affectionately refer to himself during this time as a “surf-rat.” David moved to Europe in the mid-1980s and undertook a study of organic chemistry and nutrient cycling in Swiss lakes, receiving his Ph.D. degree from the Swiss Federal Institute of Technology, ETH in Zurich in 1989. Arriving in Zurich without knowing a word of German, let alone Swiss German, David quickly adopted the culture and customs of the country. His affinity for European languages and culture would serve him well throughout his professional and personal life.

After earning his degree, David completed post-doctoral research at the French Institute of Petroleum in Rueil-Malmaison, and then at the University of Indiana at Bloomington. In 1992 he accepted a position as Assistant Professor at Northwestern University, where he stayed until 2000, when he came to the University of South Florida.

During his 20 years at USF, David directed research that was not only intellectually stimulating but also influential in affecting public policies concerning oceans and coasts. Indeed, his landmark study of the sediments in Old Tampa Bay identified fertilizer run-off as a major cause of eutrophication and loss of seagrasses. These findings led to the banning of the use of fertilizer seasonally in Pinellas County.

It was, however, in the last decade of his career and his life that his work was most impactful on national and global scales. The Deepwater Horizon oil blowout in the Gulf of Mexico was a tragedy both for the people affected and for the environment. It was also David’s clarion call to put his prodigious geochemical skills to use in helping to understand the impacts of that spill and other previous accidents in the Gulf of Mexico. As the Chief Scientific Officer of a multinational consortium of universities, David assembled a team of researchers from Mexico, Cuba, Germany, the Netherlands, Canada, Australia, and the United States to identify the unique aspects of the mega blowout, which occurred in waters a mile



OBITUARIES

deep. After cold-calling many of these researchers, it was David's warm, disarming tone and infectious passion that wooed them to be a part of the team. He and colleagues discovered large quantities of oil deposited on the sea bottom and correctly attributed the deposition to oiled marine snow. One of his most unique contributions was working with Mexican scientists to assess the impacts of the 1979 Ixtoc-1 oil well blowout off Campeche as a basis to forecast what might happen to oil from Deepwater Horizon decades from now. David co-edited two highly regarded books and co-authored dozens of research papers based on his studies of the oil spills.

David was in every sense of the word a polymath. He was an accomplished marine scientist with a long record of achievements spanning the globe. But he was much more than that. He loved art and particularly the works of Miro, Dali and other *avant garde* artists. His office was a museum of sorts, with every inch covered in paintings and prints, ceramics, furniture, and associated chotchkes from his frequent foraging adventures to the region's garage and estate sales. Likewise, he was a student of architectural style and design and particularly appreciated the Craftsman, Prairie and Foursquare, Art Deco, Bauhaus, Minimal Traditional, and Mid-Century homes found in the neighborhoods surrounding Tampa Bay. He lived in a beautifully restored mid-century home. He will be remembered for hosting garden gatherings with faculty, students, and staff to watch July 4th fireworks or just to celebrate out of town visitors. Generous of spirit and his time, he inspired people around him to think big, act on personal convictions, and become involved in the community. A lifelong cyclist, David once claimed that his heart was three times larger than a "normal human" due to the time he spent as a professional bicycle racer in Europe; his friends know this to be, at least metaphorically, true. He was committed to collegiality, was a staunch advocate for junior faculty, and a steadfast supporter of scientific research staff. We will miss his boundless energy, inexhaustible inquisitiveness, enthusiasm, and joie de'vivre.



Dr. David Hollander aboard the R/V *Justo Sierra* sampling in 2015 near the site of the 1979 Ixtoc-1 oil well blowout in Campeche, Mexico

Appendices

Appendix A

Publications

Appendix B

Active Research Awards

Appendix C

Events in the News

APPENDIX A. PUBLICATIONS

Appendix A. Publications

Bold indicates Faculty and Research Staff/Faculty; Underline indicates CMS graduate student or post-doc. Total of 130 peer-reviewed journal articles, 3 books, 37 book chapters, and 21 additional products.

CMS PATENTS (2)

Robert H. Byrne. 2020. Systems and methods for determining carbon system parameters of water. US Patent 10,620,129.

Cliff Merz, Investor. Chitosan Based Membrane and Associated Method of Use. Provisional application submitted in May of 2019. U.S. Patent. Patent application submitted May 22, 2020.

CMS JOURNAL PUBLICATIONS (101 peer-reviewed journal articles)

Ainley, D., T. Joyce, B. Saenz, R. Pitman, J. Durban, G. Ballard, **K. Daly**, and S. Kim (2020) Foraging patterns of Antarctic minke whales in McMurdo Sound, Ross Sea. *Antarctic Science* 32 (6), 454-465, doi:10.1017/S0954102020000310.

Barnes, B. B., C. Hu, S. W. Bailey, and B. A. Franz (2020) Sensitivity of Satellite Ocean Color Data to System Vicarious Calibration of the Long Near Infrared Band. IEEE Trans. *Geosci. Remote Sens.* <https://doi.org/10.1109/TGRS.2020.3000475>

Bartlett, O., S.J. Palmer, D.M. Schroeder, E.J. MacKie, T.T. Barrows, and **A.G.C. Graham** (2020) Geospatial simulations of airborne ice-penetrating radar surveying reveal elevation under-measurement bias for ice-sheet bed topography. *Annals of Glaciology*, 61, 81, 46-57.

Beccari, V., S. Spezzaferri, S. Stainbank, **P. Hallock**, D. Basso, A. Caragnano, C. Pisapia, and the Maldives CUSO Scientific Party (2020) Responses of reef bioindicators to recent temperature anomalies in distinct areas of the North Ari atolls and Rasdhoo (Maldives). *Ecol. Indic.* 112: Article # 106128, doi: 10.1016/j.ecolind.2020.106128.

Berenshtein, I., C.B. Paris, N. Perlin, M.M. Alloy, S.B. Joye, **S. Murawski**. 2020. Invisible oil beyond the *Deepwater Horizon* satellite footprint. *Science Advances* 6(7); eaaw8863
DOI: 10.1126/sciadv.aaw8863

Bockus, A. B., LaBreck, C. J., Camberg, J. L. and **B. A. Seibel**. 2020. Thermal range and physiological tolerance mechanisms in two shark species from the Northwest Atlantic. *Biol. Bull.* 238: 131–144.

Breithaupt, J. L., Smoak, J. M., Bianchi, T. S., Vaughn, D., Sanders, C. J., Radabaugh, K.R., Osland, M.J.; Feher, L.C.; Lynch, J.C.; Cahoon, D.R.; Anderson, G.H.; Whelan, K.R.T.; **Rosenheim, B.E.**; Moyer, R.P.; Chambers, L.G. (2020). Increasing rates of carbon burial in southwest Florida coastal wetlands. *Journal of Geophysical Research: Biogeosciences*, 125, e2019JG005349. doi:10.1029/2019JG005349

Brizzolara, J.L., S.E. Grasty, A. Ilich, J.W. Gray, D.F. Naar, and S.A. Murawski (2020) Characterizing benthic habitats in two Marine Protected Areas on the West Florida Shelf, *GeoHab Atlas*, Chapter 36, 605-618, <https://doi.org/10.1016/B978-0-12-814960-7.00036-1>.

Bronselaer, B., Russell, J. L., Winton, M., **Williams, N. L.**, Key, R. M., Dunne, J. P., et al. (2020). Importance of wind and meltwater for observed chemical and physical changes in the Southern Ocean. *Nature Geoscience*, 13(1), 35–42. <https://doi.org/10.1038/s41561-019-0502-8>

APPENDIX A. PUBLICATIONS

- Burd, A.B., J.P. Chanton, **K.L. Daly**, S. Gilbert, U. Passow, and A. Quigg (2020) The science behind marine-oil snow and MOSSFA: Past, present, future. *Progress in Oceanography* 187: 102398, <https://doi.org/10.1016/j.pocean.2020.102398>.
- Cabanes, S., S. Espa, **B. Galperin**, R. M. B. Young, and P. L. Read, 2020: Revealing the intensity of turbulent energy transfer in planetary atmospheres. *Geophysical Research Letters*, **47**, e2020GL088685.
- Chacin, D.H., **C.D. Stallings**, M. Eggertsen, C. Åkerlund, C. Halling, and C. Berkström. 2020. Altered tropical seascapes influence patterns of fish assemblage and ecological functions in East Africa. *Scientific Reports* 10: 12479.
- Clark, K., H., Vecchione, M., **B. A. Seibel** and H. L. Judkins. 2021. Species abundance, spatial and vertical distributions, and eye-size trends of large heteropods (Pterotracheidae and Carinariidae) in the northern Gulf of Mexico. *Amer. Malacol. Bull.* 38, 73-82. <https://doi.org/10.4003/006.038.0201>
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- Curtis, J.S., M.A. Albins, **E.B. Peebles**, **C.D. Stallings**. (2020) Stable isotope analysis of eye lenses from invasive lionfish yields record of resource use. *Marine Ecology Progress Series* 637, 181–194.
- Dell'Apa, A., **J. P. Kilborn**, W. J. Harford. 2020. Advancing ecosystem management strategies for the Gulf of Mexico's fisheries resources: implications for the development of a fishery ecosystem plan. *Bulletin of Marine Science*. 96(4):617-640. <https://doi.org/10.5343/bms.2019.0081>.
- Deutsch, C., J. L. Penn, and **B. A. Seibel**. 2020. Metabolic trait diversity shapes marine biogeography. *Nature*. DOI: 10.1038/s41586-020-2721-y.
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- Galperin, B.**, and Sukoriansky, S., 2020: QNSE theory of the anisotropic energy spectra of atmospheric and oceanic turbulence. *Physical Review Fluids*, **5**, 063803, DOI: 10.1103/PhysRevFluids.5.063803.
- Garcia, R. A., Z. Lee, **B. Barnes**, **C. Hu**, H. M. Dierssen, and E. J. Hochberg (2020) Benthic classification and IOP retrievals in shallow water environments using MERIS imagery. *Remote Sens Environ* 249:112015

APPENDIX A. PUBLICATIONS

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- Hamlington, B. D. et al. (2020). Understanding of contemporary regional sea-level change and the implications for the future. *Rev. Geophys.*, 58, e2019RG000672. <https://doi.org/10.1029/2019RG000672>..
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- Hollister, A.P., M. Kerr, K. Malki, E. Muhlbach, M. Robert, C.L. Tilney, M. Breitbart, K.A. Hubbard, and **K.N. Buck** (2020). Regeneration of macronutrients and trace metals during phytoplankton decay: an experimental study. *Limnology and Oceanography*, 65: 1936-1960.
- Howard, E. H., J. L. Penn, H. Frenzel, **B. A. Seibel**, D. Bianchi, L. Renault, F. Kessouri, M. A. Sutula, J. C. McWilliams, and C. Deutsch. 2020. Climate driven aerobic habitat loss in the California Current System. *Science Advances*. 6: eaay3188.
- Hu, C.**, L. Feng, and Q. Guan (2020). A Machine Learning Approach to Estimate Surface Chlorophyll a Concentrations in Global Oceans From Satellite Measurements. *IEEE Trans. Geosci. & Remote Sens.*, DOI: 10.1109/TGRS.2020.3016473
- Jaeger, J.M. and **A.E. Shevenell** (2020) Perspective: Steering iceberg armadas, *Science*, 370 (6517), 662-663.
- Janssen, D. J., Sieber, M., Ellwood, M. E., **Conway, T. M.**, Barrett, P., Chen, X., de Souza, G. F., Hassler, C. S., and Jaccard, S. L. (2020). Trace metal and nutrient dynamics across broad biogeochemical gradients in the Indian and Pacific sectors of the Southern Ocean. *Marine Chemistry*. 221, 103773. <https://doi.org/10.1016/j.marchem.2020.103773>
- Johns, E. M., R. Lumpkin, N. F. Putman, R. H. Smith, **F. E. Muller-Karger**, **D. Rueda**, **C. Hu**, M. Wang, M. T. Brooks, L. J. Gramer, and F. E. Werner (2020). The establishment of a pelagic Sargassum population in the tropical Atlantic: Biological consequences of a basin-scale long distance dispersal event. *Progress in Oceanography*, <https://doi.org/10.1016/j.pocean.2020.102269>.
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APPENDIX A. PUBLICATIONS

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APPENDIX A. PUBLICATIONS

CMS OTHER WORKS AND REPORTS (20)

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- König, D., **Conway, T. M.**, Ellwood, M. J., Homoky, W. B., and Tagliabue, A. (in review) Constraining the processes governing marine iron isotope cycling with a global ocean model. *Global Biogeochem. Cycles*.
- Laureano-Rosario, Abdiel, Erin M. Symonds, Adriana González-Fernández, Omar G. Lizano R., Darner Mora Alvarado, Pablo Rivera Navarro, Andrei Badilla-Aguilar, **Digna Rueda-Roa, Daniel B. Otis**, Valerie J. Harwood, Maryann R. Cairns, **Frank E. Muller-Karger**. 2020 (in press). The relationship between environmental parameters and microbial water quality at two Costa Rican beaches from 2002 to 2017. *Marine Pollution Bulletin*.
- Murawski, S.A.** (Principal Investigator) 2020. Continental shelf seafloor mapping, benthic habitat surveys, and reef fish assessments in the eastern Gulf of Mexico, 2015 – 2019 *Technical Report of the Continental Shelf Characterization, Assessment, and Mapping Project (C-SCAMP) to the National Fish and Wildlife Foundation. November 2020. 39 pp.*
- Murawski, S.A.** (Principal Investigator) Restoring Fish and Sea Turtle Habitat on the West Florida Continental Shelf: Benthic Habitat Mapping, Characterization and Assessment. *National Fish and Wildlife Foundation, Gulf Environmental Benefit Fund, Final Programmatic Report GBEF Grant #45892. 45 pp.*
- Read, P.L., R.M.B. Young, H Scolan, E Ferrero, **B Galperin**, F Ives, M Manfrin, S. Cabanes, and S. Espa, 2021: Zonostrophic beta-plumes, breaking waves and zonal jets in locally-forced, large-scale, shallow water experiments. *Earth and Space Science Open Archive ESSOAr*.
- Sieber, M., **Conway, T. M.**, de Souza, G. F., Hassler, C.S., Ellwood, M.J. & Vance, D. (in revision). Isotopic fingerprinting of biogeochemical processes and iron sources in the iron-limited surface Southern Ocean. *Earth Planet. Sci. Lett.*

APPENDIX A. PUBLICATIONS

- SCOR Working Group 154. 2020. Recommendations for plankton measurements on the GO-SHIP program with relevance to other sea-going expeditions. SCOR Working Group 154 GO-SHIP Report. Scientific Committee on Oceanic Research, 70pp. DOI: <http://dx.doi.org/10.25607/OBP-718>
- Shen, Z.; **Rosenheim, B.E.**; Törnqvist, T.E.; Lang, A. (2020). "Anthropogenically expedited transit reduces organic carbon loss in the lower Mississippi River: dataset." Coastal Carolina University, Data Set: <https://digitalcommons.coastal.edu/science-data-sets/1>
- Steffen, J. M., *Summers, B. A., **Conway, T. M.**, Thyng, K. M., Sherrell, R. M., German, C. R. & Fitzsimmons, J. N. (in revision). Short residence times for hydrothermally-sourced dissolved iron in the deep ocean. *Nature Geoscience*.
- Urban Jr., E.R., A.R. Bowie, P.W. Boyd, **K.N. Buck**, M.C. Lohan, S.G. Sander, R. Schlitzer, A. Tagliabue, and D. Turner (2020). The importance of bottom-up approaches to international cooperation in ocean science: The iron story. *Oceanography*, 33: 11-15.
- Wang, M., and **C. Hu** (2020), Automatic extraction of Sargassum features on Sentinel-2 MSI images. *IEEE Trans. Geosci. Remote Sens.*, Doi: 10.1109/TGRS.2020.3002929.
- Weisberg, R.H., J. Chen, and Y. Liu** (2020), Hillsborough Bay Inflow Modification Study, Project Report to City of Tampa as part of the Tampa Augmentation Project, 23 pp.
- Weisberg, R.H. (2020), Written comments at an EPA Public Hearing for the Kampachi Fish Farms, LLC, 1/28/20.
- Williams, N. L.**, Juranek, L. W., Feely, **R. A.**, **Russell, J. L.**, Dunne, J., & Bednaršek, N. (in prep; last chapter of PhD dissertation). Future changes in carbonate chemistry in the Southern Ocean under ocean acidification using insights from SOCCOM biogeochemical floats.

APPENDIX B. ACTIVE RESEARCH AWARDS

Appendix B. Active Research Awards

Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Ainsworth,Cameron		University of Miami	19460.00	9/1/2019	6/30/2020
Barnes,Brian B		Kent State University	20720.88	5/1/2016	4/30/2021
Barnes,Brian B		National Aeronautics & Space Admin	51220.75	1/1/2017	12/31/2021
Barnes,Brian B		Fish and Wildlife Research Institute	13082.09	9/22/2018	12/31/2020
Bonin,Jennifer A		National Aeronautics & Space Admin	73439.55	3/1/2017	2/28/2021
Breitbart,Mya E		US Israel Binational Science Foundation	34314.21	9/1/2015	8/31/2020
Breitbart,Mya E		National Science Foundation	138877.77	7/1/2016	6/30/2021
Breitbart,Mya E		National Science Foundation	29491.31	9/15/2016	8/31/2021
Buck,Kristen N		National Science Foundation	-42.61	7/15/2015	6/30/2019
Buck,Kristen N		National Science Foundation	41078.37	2/1/2017	1/31/2020
Buck,Kristen N		National Science Foundation	63158.87	3/1/2018	2/28/2022
Buck,Kristen N		University of Alaska Fairbanks	4446.98	6/14/2018	8/31/2021
Buck,Kristen N		National Science Foundation	30711.25	9/1/2018	8/31/2021
Buck,Kristen N		Woods Hole Oceanographic Institute	22416.34	10/9/2018	9/15/2019
Buck,Kristen N		National Science Foundation	33366.91	1/1/2019	12/31/2021
Buck,Kristen N		Florida Fish and Wildlife Conservation	307728.07	10/3/2019	6/30/2020

APPENDIX B. ACTIVE RESEARCH AWARDS

Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Buck,Kristen N		Fish and Wildlife Research Institute	24265.32	12/12/2019	6/30/2020
Byrne,Robert H		US Geological Survey	0.50	9/1/2014	8/31/2017
Byrne,Robert H		Texas A&M University	-0.13	9/1/2015	8/31/2019
Byrne,Robert H		National Science Foundation	86982.26	2/1/2017	1/31/2022
Byrne,Robert H		National Science Foundation	39502.27	2/1/2017	1/31/2022
Byrne,Robert H		National Science Foundation	32596.12	2/15/2020	1/31/2023
Chambers,Don P		National Aeronautics & Space Admin	147938.79	2/16/2016	8/31/2020
Chambers,Don P		University of Miami	156900.39	7/1/2017	9/30/2021
Chambers,Don P	Galperin, Boris	University of Miami	62563.80	7/1/2017	9/30/2021
Chambers,Don P		University of Miami	3468.23	7/1/2017	9/30/2021
Chambers,Don P		Arizona State University	65630.74	8/22/2017	8/21/2020
Chambers,Don P		University of Central Florida	30246.07	9/1/2017	8/31/2020
Chambers,Don P		NASA Jet Propulsion Laboratory	19551.56	5/27/2019	9/30/2023
Conway,Timothy		National Science Foundation	129007.20	8/15/2017	7/31/2021
Conway,Timothy		National Science Foundation	5604.26	8/15/2017	7/31/2021
Conway,Timothy		National Science Foundation	57040.78	9/1/2018	8/31/2021
Daly,Kendra L		University of Georgia	31471.21	1/1/2016	12/31/2019
Daly,Kendra L		University of Rhode Island	25828.10	5/1/2020	9/30/2021

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Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Dixon, Jacqueline Eaby		US Geological Survey	1358260.00	8/1/2017	7/31/2022
Dixon, Jacqueline Eaby		US Geological Survey Fish and Wildlife	24346.41	5/1/2018	2/20/2020
Grasty, Sarah E		Research Institute National Marine	4807.46	3/20/2020	8/31/2021
Greely, Teresa M		Sanctuary Foundation National Marine	8722.26	8/1/2018	6/30/2020
Greely, Teresa M		Sanctuary Foundation National Aeronautics	3695.39	8/1/2018	6/30/2020
Hu, Chuanmin		& Space Admin Nova Southeastern	37864.64	10/9/2014	2/28/2020
Hu, Chuanmin		University Nova Southeastern	24069.87	1/1/2015	6/30/2020
Hu, Chuanmin	Romero, Isabel	University National Aeronautics	137164.51	1/1/2015	6/30/2020
Hu, Chuanmin		& Space Admin	46895.42	3/1/2015	2/28/2021
Hu, Chuanmin		University of Miami	-0.07	10/1/2015	9/30/2020
Hu, Chuanmin		University of Miami	83488.06	10/1/2015	9/30/2020
Hu, Chuanmin		University of Miami	-0.02	1/1/2016	12/31/2019
Hu, Chuanmin		University of Miami National Aeronautics	24652.90	1/1/2016	12/31/2019
Hu, Chuanmin		& Space Admin National Aeronautics	2463.69	9/1/2016	8/31/2019
Hu, Chuanmin		& Space Admin National Aeronautics	114170.62	1/1/2017	12/31/2021
Hu, Chuanmin		& Space Admin Pennsylvania State	58307.53	2/21/2017	2/20/2021
Hu, Chuanmin		University	25214.80	2/24/2017	2/23/2021

APPENDIX B. ACTIVE RESEARCH AWARDS

Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
		Observatoire du Milieu Marin			
Hu,Chuanmin		Martiniquai	-10397.50	5/11/2017	9/30/2018
		University of Southern Mississippi			
Hu,Chuanmin			72542.84	6/1/2017	5/31/2021
Hu,Chuanmin		University of Miami	94785.74	1/1/2018	6/30/2020
		Global Science & Technology, Inc.	0.00	4/22/2019	5/31/2019
		National Aeronautics & Space Admin	87321.94	7/15/2019	7/14/2022
Hu,Chuanmin		Global Science & Technology, Inc.	172785.30	6/1/2019	5/31/2021
		National Aeronautics & Space Admin	29239.74	9/1/2019	8/31/2022
Hu,Chuanmin		University of Miami	5127.67	6/1/2019	9/30/2021
		National Aeronautics & Space Admin	20161.10	11/1/2019	10/31/2022
		Fish and Wildlife Research Institute	90491.79	10/3/2019	6/30/2020
		Natl Oceanic & Atmospheric Admin	150647.57	9/1/2017	8/31/2021
Kilborn,Joshua		Gulf of Mexico Fishery Mgmt Council	57813.81	12/30/2019	12/31/2020
		Southeast Coastal Ocean Observing Region	24945.19	6/1/2016	5/31/2021
Lembke,Chad E		Florida International University	101063.35	9/1/2018	8/31/2021
Lembke,Chad E		University of Miami	0.05	8/1/2018	7/31/2019
		Florida Fish and Wildlife Conservation	0.00	3/19/2019	6/30/2019

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Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Lembke,Chad E		Southeast Coastal Ocean Observing Region	28929.96	7/1/2019	6/30/2021
Lembke,Chad E		Florida Fish and Wildlife Conservation	478494.28	10/28/2019	9/1/2020
Li,Yun		National Science Foundation	1128.21	9/1/2017	8/31/2020
Liang,Xinfeng	Chambers, Don	National Science Foundation	8266.20	9/1/2017	8/31/2020
Liang,Xinfeng		National Science Foundation	14993.53	9/1/2017	8/31/2020
Liang,Xinfeng	Chambers, Don	National Science Foundation	8266.20	9/1/2017	8/31/2020
Liang,Xinfeng		National Science Foundation	3179.91	9/1/2017	8/31/2020
Liang,Xinfeng		National Aeronautics & Space Admin	15607.41	6/1/2018	5/31/2021
Liang,Xinfeng		National Aeronautics & Space Admin	6895.17	9/1/2018	8/31/2020
Liu,Yonggang	Li, Yun	Gulf of Mexico Research Initiative	17733.70	1/1/2018	6/30/2020
Liu,Yonggang		Gulf of Mexico Research Initiative	191452.17	1/1/2018	6/30/2020
Liu,Yonggang	Weisberg, Robert	Gulf of Mexico Research Initiative	14818.51	1/1/2018	6/30/2020
Liu,Yonggang	Li, Yun	Gulf of Mexico Research Initiative	17733.70	1/1/2018	6/30/2020
Liu,Yonggang		Gulf of Mexico Research Initiative	19874.26	1/1/2018	6/30/2020
Liu,Yonggang	Weisberg, Robert	Gulf of Mexico Research Initiative	14818.51	1/1/2018	6/30/2020
Luther,Mark E		Greater Tampa Marine Advisory Council	10516.50	4/9/2004	3/6/2024

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Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Luther,Mark E		University of Maryland Southeast Coastal Ocean Observing Region	-1135.68	6/1/2011	5/31/2017
Luther,Mark E		Texas A&M University	50084.69	6/1/2016	5/31/2021
Luther,Mark E	Lembke, Chad	Texas A&M University Tampa Bay Estuary Program	42484.41	6/1/2016	5/31/2021
Luther,Mark E		Tampa Bay Estuary Program	0.00	10/1/2017	2/28/2019
Luther,Mark E		Tampa Bay Estuary Program	17734.76	1/1/2019	12/31/2020
Luther,Mark E	Landry, Shawn	Tampa Bay Estuary Program	483.72	1/1/2019	12/31/2020
Luther,Mark E		Southeast Coastal Ocean Observing Region	14943.38	4/1/2019	3/31/2021
Merz,Clifford R		National Academy of Sciences	939923.15	11/1/2018	12/31/2021
Mitchum,Gary T		NASA Jet Propulsion Laboratory	-0.09	10/1/2013	6/30/2019
Mitchum,Gary T Montes		University of Hawaii National Aeronautics & Space Admin	20358.60	9/1/2017	8/31/2021
Herrera,Enrique		Consortium for Ocean Leadership	122002.55	1/2/2018	1/1/2022
Muller,Pamela H		National Aeronautics & Space Admin	-1688.47	2/3/2012	1/31/2016
Muller-Karger,Frank E	Breitbart, Mya	National Science Foundation	83067.82	8/18/2014	8/17/2021
Muller-Karger,Frank E		National Aeronautics & Space Admin	-104.62	2/1/2014	7/31/2019
Muller-Karger,Frank E		National Aeronautics & Space Admin	1075307.59	8/18/2014	8/17/2021
Muller-Karger,Frank E	Breitbart, Mya	National Aeronautics & Space Admin	83067.82	8/18/2014	8/17/2021

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Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Muller-Karger, Frank E		National Aeronautics & Space Admin	2839.29	8/18/2014	8/17/2021
Muller-Karger, Frank E		University of Fiji	-0.07	4/15/2015	4/14/2018
Muller-Karger, Frank E		National Aeronautics & Space Admin	2160.43	9/1/2015	7/31/2019
Muller-Karger, Frank E	Stallings, Christopher	University of Miami	0.00	9/1/2015	8/31/2019
Muller-Karger, Frank E	Stallings, Christopher	University of Miami	161.28	9/1/2015	8/31/2019
Muller-Karger, Frank E	Lorenzoni Fellowship	National Aeronautics & Space Admin	-862.23	5/1/2016	4/30/2020
Muller-Karger, Frank E	Lorenzoni Fellowship	National Aeronautics & Space Admin	135547.47	5/1/2016	4/30/2020
Muller-Karger, Frank E		Texas A&M University	25000.00	6/1/2016	5/31/2021
Muller-Karger, Frank E		National Science Foundation	55068.77	8/15/2017	7/31/2022
Muller-Karger, Frank E		National Science Foundation	1700.00	8/15/2017	7/31/2022
Muller-Karger, Frank E		Oregon State University	37781.42	1/18/2018	1/17/2020
Muller-Karger, Frank E		National Science Foundation	111871.06	8/15/2018	7/31/2021
Muller-Karger, Frank E	Dixon, Timothy	National Science Foundation	83695.50	8/15/2018	7/31/2021
Muller-Karger, Frank E		University of Michigan	55114.65	9/1/2018	11/30/2019
Muller-Karger, Frank E		University of Michigan	162.95	9/1/2018	11/30/2019
Muller-Karger, Frank E		University of Puerto Rico	61702.52	2/1/2019	1/31/2022
Muller-Karger, Frank E		Tampa Bay Regional Planning Council	297.89	9/1/2018	8/31/2019
Muller-Karger, Frank E		Natl Oceanic & Atmospheric Admin	55273.50	9/1/2019	8/31/2022

APPENDIX B. ACTIVE RESEARCH AWARDS

Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Muller-Karger, Frank E		National Aeronautics & Space Admin	1028.62	10/10/2019	10/9/2022
Murawski, Steven	Daly, Kendra	Consortium for Ocean Leadership	112.13	1/1/2018	6/30/2020
Murawski, Steven	Greely, Teresa	Consortium for Ocean Leadership	9725.08	1/1/2018	6/30/2020
Murawski, Steven	Hu, Chuanmin	Consortium for Ocean Leadership	-554.99	1/1/2018	6/30/2020
Murawski, Steven		Consortium for Ocean Leadership	-7764.97	1/1/2015	12/31/2018
Murawski, Steven		National Fish and Wildlife Foundation	304915.56	1/1/2015	12/2/2020
Murawski, Steven		Gulf of Mexico Alliance	12730.11	10/1/2016	6/30/2020
Murawski, Steven		National Academy of Sciences	318137.85	12/1/2016	9/30/2019
Murawski, Steven		Consortium for Ocean Leadership	1596732.49	1/1/2018	6/30/2020
Murawski, Steven	Ainsworth, Cameron	Consortium for Ocean Leadership	90037.47	1/1/2018	6/30/2020
Murawski, Steven	Chavez, Todd	Consortium for Ocean Leadership	55122.72	1/1/2018	6/30/2020
Murawski, Steven	Daly, Kendra	Consortium for Ocean Leadership	112.13	1/1/2018	6/30/2020
Murawski, Steven	Gilbert, Sherryl	Consortium for Ocean Leadership	424520.88	1/1/2018	6/30/2020
Murawski, Steven	Greely, Teresa	Consortium for Ocean Leadership	9725.08	1/1/2018	6/30/2020
Murawski, Steven	Hotaling, Liesl	Consortium for Ocean Leadership	94476.33	1/1/2018	6/30/2020
Murawski, Steven	Hu, Chuanmin	Consortium for Ocean Leadership	-554.99	1/1/2018	6/30/2020
Murawski, Steven		Consortium for Ocean Leadership	227189.93	1/1/2018	6/30/2020

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Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
		Texas A&M Research			
Murawski,Steven		Foundation	214626.87	10/1/2017	10/31/2020
		Tampa Bay			
		Environmental			
Murawski,Steven		Restoration Fund	155.01	10/1/2019	12/31/2021
		Natl Oceanic &			
Murawski,Steven		Atmospheric Admin	4657.88	9/1/2019	3/31/2021
		National Aeronautics			
Otis,Daniel B		& Space Admin	18729.83	10/11/2019	10/10/2022
		Florida Fish and			
Otis,Daniel B		Wildlife Conservation	64628.09	1/9/2020	6/30/2021
		Natl Oceanic &			
Paul III,John H		Atmospheric Admin	17403.32	9/1/2015	8/31/2019
		University of Miami			
Peebles,Ernst B		University of Southern	289968.54	10/1/2015	9/30/2021
		Mississippi			
Romero,Isabel C		National Science	159659.31	1/1/2018	6/30/2020
		Foundation			
Rosenheim,Brad		National Science	288.48	6/15/2016	5/31/2021
		Foundation			
Rosenheim,Brad		National Science	49253.47	9/15/2016	8/31/2021
		Foundation			
Rosenheim,Brad E		National Science	113705.94	3/15/2017	2/28/2021
		Foundation			
Rosenheim,Brad E		National Science	11599.98	3/15/2017	2/28/2021
		Foundation			
Rosenheim,Brad E		National Science	46142.93	8/1/2019	7/31/2022
		Tampa Bay Estuary			
Russell,David R		Program	0.00	11/1/2018	3/31/2019
		Natl Oceanic &			
Seibel,Brad A		Atmospheric Admin	-99.01	1/1/2017	12/31/2019
		University of Rhode			
Seibel,Brad A		Island	132841.58	12/1/2016	9/30/2020
		University of			
Seibel,Brad A		Washington	30242.02	9/1/2018	8/31/2021

APPENDIX B. ACTIVE RESEARCH AWARDS

Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Seibel,Brad A		University of Washington	65453.88	9/1/2018	8/31/2021
Seibel,Brad A		University of Washington	3310.10	12/1/2018	11/30/2020
Shevenell,Amelia		National Science Foundation	49968.64	8/1/2018	4/30/2022
Shevenell,Amelia		National Science Foundation	6000.00	8/1/2018	4/30/2022
Stallings,Christopher		Florida Fish and Wildlife Conservation National Science Foundation	16292.17	1/27/2016	8/31/2019
Stallings,Christopher		Florida Department of Agriculture	39257.59	2/15/2019	7/31/2020
Stallings,Christopher		Florida Fish and Wildlife Conservation Southeast Coastal Ocean Observing Region	68426.00	9/12/2019	8/31/2020
Stallings,Christopher		Florida Fish and Wildlife Conservation Southeast Coastal Ocean Observing Region	2326.56	1/29/2020	10/31/2023
Weisberg,Robert H		Southeast Coastal Ocean Observing Region	71191.72	6/1/2016	5/31/2021
Weisberg,Robert H		Southeast Coastal Ocean Observing Region	149495.54	6/1/2016	5/31/2021
Weisberg,Robert H		Pinellas County Florida (Restore Act)	24636.46	11/6/2016	3/31/2020
Weisberg,Robert H	Russell, David	Pinellas County Florida (Restore Act)	1587.30	11/6/2016	3/31/2020
Weisberg,Robert H		Pinellas County Florida (Restore Act)	77545.46	11/29/2016	12/31/2020
Weisberg,Robert H		National Academy of Sciences	372891.83	11/1/2018	12/31/2021
Weisberg,Robert H	Russell, Randy	National Academy of Sciences	31409.05	11/1/2018	12/31/2021
Weisberg,Robert H		Tampa Bay Estuary Program	10818.33	6/1/2018	12/31/2020

APPENDIX B. ACTIVE RESEARCH AWARDS

Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Weisberg,Robert H		Southeast Coastal Ocean Observing Region	84840.68	4/1/2019	3/31/2021
Weisberg,Robert H		City of Tampa	32044.13	6/25/2019	6/30/2020
Weisberg,Robert H		Florida Fish and Wildlife Conservation	273645.68	10/3/2019	6/30/2020

APPENDIX C. EVENTS IN THE NEWS

APPENDIX C. EVENTS IN THE NEWS

- 1/9/2020, Mayor's Lounge with Rick Kriseman, <https://www.youtube.com/watch?v=HFNTI0jdJ5Q>
- 1/9/2020, How Climate Change could impact Florida, <https://www.wfla.com/daytime/how-climate-change-could-impact-florida/>
- 1/14/2020, How Viruses Secretly Control the Planet, <https://www.insidescience.org/news/how-viruses-secretly-control-planet>
- 1/16/2020, Red Tide Has Dissipated In The Gulf: What Happened, And What's Next?, <https://wusfnews.wusf.usf.edu/post/red-tide-has-dissipated-gulf-what-happened-and-whats-next>
- 1/24/2020, Scientists and artists collaborate at USF College of Marine Science, <https://creativepinellas.org/magazine-items/scientists-and-artists-collaborate-at-usfs-college-of-marine-science/>
- 1/20/2020, When art met science: marine art exhibit creates community, <https://crowneststpete.com/2020/01/20/when-art-met-science-marine-art-exhibit-creates-community/>
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