



USF / COLLEGE OF
MARINE SCIENCE



ANNUAL REPORT

January 1 – December 31, 2018

Submitted by: Dean Jacqueline E. Dixon

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THE VIEW FROM THE BRIDGE

The View from the Bridge



2018 was dominated by the whirl of consolidation. While much time and effort has been expended envisioning what a unified USF will look like, as Dean I focused my effort on developing a vision for a new center for coastal resiliency (CORE), as described below.

We are in the midst of a new normal with respect to coastal threats. Beginning in the mid- to late 1990s, Miami Beach and Fort Lauderdale began to experience frequent episodes of small-scale flooding, sometimes called “nuisance flooding” or “sunny day” flooding. An octopus even made headlines for landing in a Miami parking garage¹. More recently such flooding has expanded to many coastal communities. Frequent saltwater intrusion is now costing some individuals and businesses thousands of dollars a year in property damage, and may soon cause hundreds of millions of dollars in damages to municipal infrastructure such as water and sewer works across the state, in addition to threatening our supply of fresh water.



Street flooding in Coffee Pot Bayou, St. Petersburg, Oct 2018 (photo by J. Dixon).

This fall, Mark Futch, a well-known fishing guide in Boca Grande and co-founder of *Save the Tarpon*, died of a massive heart attack². He was 64 years old. While the immediate cause of death was considered natural, his family believes the ultimate cause was stress associated with Florida’s 2018 red

¹ <https://www.yaleclimateconnections.org/2017/01/the-bizarre-case-of-the-octopus-in-the-parking-garage/>

² <https://www.tampabay.com/opinion/columns/lake-okeechobees-blue-green-algae-and-red-tide-ruined-the-dreams-of-my-brother-the-fishing-guide-and-literally-worried-him-to-death-20181102/>

THE VIEW FROM THE BRIDGE

tide, one of the largest and longest on record. Mark's fishing guide business failed as a direct result of this environmental disaster, as did many other coastal businesses linked to fishing and tourism.

In early October, Hurricane Michael roared ashore on the Florida Panhandle, causing at least 45 fatalities and billions of dollars in property damage and lost business³. It was the strongest recorded storm to ever hit the Florida Panhandle. While hurricanes are common in Florida, this one caught many people by surprise because of its rapid intensification to a near Category 5. Many Florida communities are particularly ill-prepared for the next "big one"⁴. The term "monster storm" used to mean a storm of epic size and scale; monster storms are now common.



Dead fish from the fall 2018 red tide



A search-and-rescue worker walks down Main Street in Mexico Beach, Florida, after the passage of Hurricane Michael. Photo by Eric Thayer for the New York Times.

Each of these vignettes reflects Florida's status as a maritime state, one that is both dependent upon, and vulnerable to, the ocean and its health. Florida has the longest coastline of any state in the continental US. Its coastal areas are home to millions of residents. Coastal tourism and recreation contribute over 1.7 million jobs to the nation's economy and over 200,000 jobs and \$50 billion to the state's economy. The fishing industry contributes more than the cattle and citrus industries combined. Seafood sales contribute more than \$30 billion to the state's economy. Florida is uniquely dependent on maritime transportation for supply of petroleum products and other commodities for its growing economy. The Gulf of Mexico supplies more than 90 percent of offshore oil and gas to the nation and 40 percent of the seafood supply caught off the continental US.

The health and productivity of Florida's coastal communities are threatened by flooding from rising seas and catastrophic storm and precipitation events, red tide and other harmful algal blooms, water-quality degradation from ineffective sewer and storm water infrastructure, agricultural run-off and oil spills, unsustainable coastal development, and salt water intrusion into our coastal aquifers. **Florida**

³ Cost of Climate Change Could Hammer Florida (<http://wusfnews.wusf.usf.edu/post/cost-climate-change-could-hammer-florida>)

⁴ https://www.washingtonpost.com/graphics/2017/health/environment/tampa-bay-climate-change/?noredirect=on&utm_term=.2046d8a5169d

THE VIEW FROM THE BRIDGE

has been ground zero for recent environmental and climate-related disasters. In the last decade, the Deepwater Horizon oil disaster inflicted severe economic hardship on Gulf Coast businesses and personal livelihoods. Its negative impacts on the coastal ecosystem nearly ten years later are still being felt. Hurricanes Irma in 2017 and Michael in 2018 were fueled by warmer than average waters. The extensive red tide and cyanobacteria blooms reflect a complex sequence of events, but ultimately human-caused nutrient pollution is a key factor, and the only one we can do anything about.

However, these disasters are but symptoms of larger, more endemic trends that threaten the state's coastal areas and hence, the state itself. Underscoring the critical need for research to ensure Florida's coastal resiliency is the recent UN-backed climate change report⁵. It states in no uncertain terms that the world faces an unprecedented need to get climate change under control within the next ten years. **The report calls for decisive action in the face of the greatest challenge humanity has ever faced.**

Understanding how our coastal environment is evolving and how these changes affect the coastal resources of Florida requires more than just local observations and studies. The Gulf of Mexico and Florida's Atlantic coast are intrinsically tied to the global ocean system and are affected by ocean changes far away. To protect our coastal environment and make useful predictions, scientists and engineers must understand connections between our local coasts and the global ocean in a multi-disciplinary way that involves all STEM fields, including chemistry, biology, geology, physics, and engineering.

This is where researchers at the College of Marine Science (CMS) can lead the way. For more than 50 years, USF's CMS has stood at the forefront of marine environmental observation and prediction, helping to inform effective solutions for Florida, the nation, and the planet. But preparing for resilient communities does not stop there. To effect meaningful changes that improve resiliency in the face of unprecedented challenges, scientists and engineers must work in partnership with K-12 educators, doctors and other healthcare professionals, resource managers and regulators, policymakers, communication professionals, artists and humanities scholars whose work can help frame environmental issues and bridge the gap between scientific knowledge and the public. **To be effective, science and viable technical solutions must be communicated to the public and policy officials, who must then engage in meaningful dialogue so that informed decisions can be made.**

In response to this challenge, the College of Marine Science worked with others throughout USF over the last year to develop a proposal to establish a Center for Coastal Resiliency (CORE) to help Florida navigate safely towards a better future in these uncertain times. The proposal includes four main objectives of 1) Hazard Assessment, 2) Hazard Mitigation, 3) Communication, Outreach, and Education, and 4) Public Policies, Plans, and Programs. This focus on resiliency aligns with our local community's strategic planning and goals. For example, St. Petersburg was the 20th city to win the

⁵ <https://www.nytimes.com/2018/10/07/climate/ipcc-climate-report-2040.html>;
https://www.washingtonpost.com/energy-environment/2018/10/08/world-has-only-years-get-climate-change-under-control-un-scientists-say/?utm_term=.4925e5ab40a2

THE VIEW FROM THE BRIDGE

Bloomberg American Cities Climate Challenge and was awarded \$2.5 million, mostly for infrastructure-related projects⁶.

Our vision for CORE will bring together scientists, engineers, communication specialists, and public policy experts from USF, as well as local state, federal, and private agencies, into a beacon of academic excellence for the state of Florida. The challenge in the year to come is to secure funding for this University-wide vision.

On a separate note, this annual report is dedicated to my stalwart Executive Administrative Specialist, Linda Kelbaugh, who is retiring at the end of April, 2019. Linda just received a 2018 Outstanding Staff Award. An excerpt from nomination letter, written by Frank Muller-Karger, is given below:

“Ms. Kelbaugh has been working at USF for over 30 years. For many years she has served as the executive Administrative Specialist for the College in the Dean's office. She has consistently shown proficiency, knowledge, and dedication to the mission of USF, well and far “above and beyond” her call of duty. She has been a unique and strong pillar of the College of Marine Science (CMS).



Linda's tasks and contributions range from handling the College's endowed fellowships, which are instrumental for new and current students to develop their full research potential, to organizing special events, such as the College's 50th anniversary celebration in 2017, to managing finances for students and the USF Foundation. From students to the Dean, they resort to her; her experience makes her a source of knowledge relevant to CMS and USF, and her attitude is always positive and collegial. Everyone's work would be harder without Linda.... Linda maintains a close relationship with CMS faculty, students and staff, and her long career at USF has helped us leverage relationships, connecting key people across networks to expand the CMS community and achieve the set goals. She connects communities across fields and disciplines. Linda is a role model and a positive influence for all in the College. She is and has been an inspiration to all of us for over 30 years. Her resourcefulness, pro-activeness and kindness make her an asset to the College, and USF, and she deserves to be recognized for a lifetime of dedication to the University.”

Bon voyage Linda. You will be greatly missed!

⁶ <https://stpetecatalyst.com/with-bloomberg-visit-st-petersburg-wins-2-5-million-to-fight-climate-change/>

College of Marine Science Leadership Team

JACQUELINE DIXON

Dean, College of Marine Science

PhD, California Institute of Technology, 1992

(727) 553-3369

jdixon@usf.edu



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

GARY MITCHUM

Associate Dean, College of Marine Science

PhD, Florida State University, 1984

(727) 553-3941

mitchum@usf.edu



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, 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.

COLLEGE OF MARINE SCIENCE LEADERSHIP TEAM

DAVID NAAR

Associate Dean of Academic Affairs, College of Marine Science

PhD, Scripps Institution of Oceanography, UCSD, 1990

(727) 553-1637

naar@usf.edu



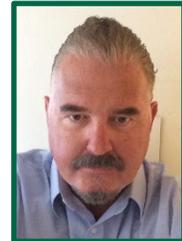
Dr. Naar is the Associate Dean of Academic Affairs and Associate Professor in Geological Oceanography. He has overseen the graduate academic program and graduate student matters since 2012. He received his bachelor's degree in Geology with an emphasis in Geophysics from University of California, Santa 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 National Science Foundation, Ocean Observatory Initiative, and ocean drilling site characterization panels for the ODP, IODP(s), and on the United States Scientific Advisory Committee (USSAC).

CHRIS SCHWINT

Budget Director, College of Marine Science

(727) 553-1038

cschwint@usf.edu



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

TIM TROWBRIDGE

Unit HR Administrator, College of Marine Science

(727) 553-3375

ttrowbridge@usf.edu



Tim Trowbridge is the Unit HR Administrator for the College of Marine Science. He received his bachelor's degree in business management and minor in leadership studies from the University of South Florida in 2008. Since that time he has been employed by the University of South Florida serving as the Unit HR Coordinator for the Student Affairs Shared Services Center from 2009-2011 and in the College of Marine Science from 2011-2012. In May 2012, Tim Trowbridge was promoted to Unit HR Administrator 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.

COLLEGE OF MARINE SCIENCE LEADERSHIP TEAM

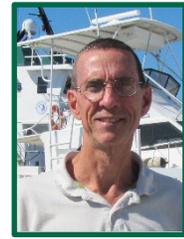
JOSEPH DONNELLY

Facilities Manager, College of Marine Science

MS, University of South Florida, 1986

(727) 553-1190

donnelly@usf.edu



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

KRISTEN KUSEK

Science Communication Strategist, College of Marine Science

MS, MA, University of South Florida, 1998

kkusek@mail.usf.edu



Ms. Kusek is an entrepreneurial science communications professional with 20 years of experience developing cross-functional programs that leverage the power of storytelling to inspire, educate, and empower. She serves as Science Communication Strategist for the USF College of Marine Science, returning to the place where she first spread her professional wings. She was the first to earn dual master's degrees in marine science and journalism/mass communications from USF (1998). Kristen most recently 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 campaigns that increased expedition sales by 12%. She spearheaded Earthwatch's first effort to use virtual reality as a marketing tool and oversaw the establishment of a brand ambassador program. Kristen has worked on every side of the science communications landscape – from reporting “live” from expeditions to leading Harvard's Wyss Institute for Biologically Inspired Engineering in its communication strategy toward a \$150 million gift, serving as creative education director in an NSF-funded IMAX film “Volcanoes of the Deep Sea,” establishing a media outreach program for a global deep ocean research group based at IFM-GEOMAR and WHOI, facilitating ocean-themed workshops for reporters with the Poynter Institute, and founding a Science Journalism Center at USF.

Graduate Program

ACADEMIC AFFAIRS

The College of Marine Science faculty and staff have continued to **increase their teaching efforts to undergraduate and graduate students**. They have increased the types of course offerings and one **new course proposal** was submitted called *Resilient, Sustainable, and Secure Port Operations and Infrastructure*, also known as *Port Sustainability*. The proposal was submitted and revised in 2018 and is pending approval by the Graduate Council in 2019. Additional special topic courses taught to graduate students on a regular basis will also be submitted as new course proposals in 2019.

Following the outcome of a seven-year review made in 2018 for years 2010-2017, we made several new improvements of the graduate program. In particular, a **new non-thesis Master of Arts in Marine Studies was proposed**, which the Curriculum Committee started crafting in 2018. The plan is to submit the new degree proposal in Fall Semester 2019 for a launch in Fall Semester 2020. This degree would be based on course work without a thesis and would serve the needs of various oceanographic agencies or individuals who want to update their knowledge and skill sets. It would also allow students who have a business, journalism, policy, education, etc., background to merge their skill sets with current oceanographic knowledge. This type of program has been popular at other oceanographic institutions and will increase our flexibility to provide collaborative degrees with other USF units.

One measure of **success** of an academic graduate program is the **job placement** of the graduates. In 2018, we had 15 PhD and eight Master's degrees conferred. Of those 15 PhD's, 12 were employed in their field of training, two are currently searching, and one is unknown. Of the eight Master's degrees, three entered a PhD program and five were employed in their field. **Thus 80% of the PhD, and 100% of the MS, students were employed in their field of training (or went on to graduate school) within a year of graduating.** The types of employment that PhD students obtained include: Science Policy Fellow, Postdoctoral Scientist, Scientific Analyst, Instructor, Associate Research Scientist in a Florida State Agency, Epidemiologist/Biological Scientist in Pinellas County, Researcher, Academic employment in China, Lead Scientist at the Ocean Conservatory, an Adjunct Professor. The types of employment that the MS student obtained include: Academic Research Assistant, Lab Manager, Biological Scientist, Geologist with the USGS, Biology Teacher at the St. Petersburg High School, and a Biological Sciences Technical Editor for NOAA Pacific Islands Fisheries Science Center.

DIVERSITY

The College of Marine Science, partnering with the College of Engineering, received a grant renewal from the Alfred P. Sloan Foundation designating USF as a University Center for Exemplary Mentoring (UCEM). This program **prepares underrepresented minority PhD students to enter and succeed as professors in the workforce. We are one of only eight such centers in the USA** and one of the selection criteria includes demonstrable institutional commitment and support. Additional support for this effort comes from National Science Foundation Bridge to the Doctorate and Graduate Research Fellowship programs, as well as from the Florida McKnight Foundation, and University Fellowships.

GRADUATE PROGRAM

These efforts were led by Director Bernard Batson and Executive Associate Dean José L. Zayas-Castro at the College of Engineering, and new Director Ana Arellano, Associate Dean David Naar, and Professor Frank Muller-Karger. Efforts to improve faculty diversity will benefit with the training of these future professors and the networking resulting from the national meetings that these individuals participate in, including SACNAS (Society for Advancement of Chicanos/Hispanics and Native Americans in Science) meetings. A new chapter of SACNAS was opened up at the USF Tampa Campus, with a kick-off event at the Tampa USF Marshall Center with Dr. Ana Arellano serving as a Panelist at the “STEM Academic Pipeline: The Hurdles and Success Stories”, along with supporting service by CMS students Natalia Lopez-Figueroa and Michell Guitard.

The college hosted **two Diversity Workshops in 2018** on January 26 and September 28. This event was mandatory for new students and current students. Faculty and staff were encouraged to attend since this workshop is step toward providing a more inclusive environment at CMS. The workshop was offered by the USFSP Office of Multicultural Affairs and gave an overview of the ten most salient identities: ability, age, ethnicity, race, national origin, faith, sex, gender, sexual orientation, and socio-economic status.

During October 10-12, five faculty members from Morgan State University, Spelman College, Xavier University, Savannah State University, and University of the Virgin Islands visited USFCMS to develop an **action plan to help increase diversity in geosciences**, foster faculty-faculty collaborations with minority serving institutions, develop a Research Experience for Undergraduates (REU). The following attended: Willie S. Rockward, PhD, Chair & Professor of Physics- **Morgan State University**, Nirajan Dhakal, PhD, Assistant Professor- **Spelman College**, Marc Boumedine, PhD, Chair & Associate Professor of Computer Science - **University of the Virgin Islands**, Galina Goloverda, PhD, Professor - **Xavier University**, and Tilahun Muche, PhD, Assistant Professor- **Savannah State University**.

Additional interactions **Morehouse College, Georgia State University, and Xavier** were planned for 2019 with Marine Science Professors Don Chambers and Brad Rosenheim, including science seminars and serving on a panel regarding climate change.

In October 2018, our Sloan Scholars and Sloan Faculty and Directors attended the National Institute for Teaching and Mentoring, where they interact with other Sloan Scholars and Faculty across the country. The meeting was held in Arlington, Virginia. Best practices for mentoring students was a primary focus of the meeting. The student scholars who attended returned from the meeting feeling energized toward completing their graduate degree.



University Center for Excellence in Mentoring group in Arlington, VA, for the National Sloan Foundation meeting, including the Director of the Sloan Foundation Program, Sloan Directors, Faculty, and Scholars from the USF College of Marine Science and Engineering

STUDENT AFFAIRS

Thirteen graduate students entered the Marine Science Program in the Fall 2018 semester. Several of them were already at sea on a research cruise or at an international science conference in Brazil. The remaining students attended Orientation Week, which included a two-day Presentation Boot Camp, designed to help students (and faculty who attended) improve the quality of presentations. Additional workshops and seminars were provided throughout 2018 to provide professional skills to assist students succeed in graduate school and beyond. **This was a stellar year for student participation in educational outreach activities** such as the National Ocean Science (Spoonbill) Bowl where teams of High School students compete in answering oceanographic questions. Additional activities include the Oceanography Camp for Girls – a camp to encourage girls entering high school to consider pathway to a STEM career, the St. Petersburg Science Festival – a city wide open house of the scientific programs at the USF St. Petersburg Campus and neighboring scientific agencies, and the Graduate Student Symposium – an internal symposium to provide experience in giving short scientific talks to a large audience. These training activities and the students' strong research and presentation efforts have paid off as documented by the numerous honors, awards, presentations, and publications listed in this annual report.

GRADUATE PROGRAM HIGHLIGHTS FROM 2018:

New Students:

- 7 entering the PhD program
- 6 entering the Master's program

Degrees Conferred:

- 15 PhD
- 8 Master's

Orientation:

- 12 students participated in 2.5 days of workshops and presentations,
- 12 students participated in the two-day Presentation Boot Camp

Student Support/Workshops provided to students, staff, and faculty:

- Mental Health First Aid certification training
- Mental Health Workshop in partnership with USFSP and FWRI
- National Geospatial-Intelligence Agency recruiter visit
- Diversity Workshop, in partnership with USFSP Office of Multicultural Affairs

Outreach Opportunities and Programs:

- Spoonbill Bowl / National Ocean Science Bowl
- Oceanography Camp for Girls
- Cephalopod International Advisory Committee Conference, 5 students participated in organizing or helping with events
- St. Petersburg Science Festival
- Graduate Student Symposium (results below)

GRADUATE PROGRAM

- Hosted students from Sunlake High School in Pasco County, FL on lab tours, and discussed careers in science/STEM and College prep

Student Publications:

- 24 Articles were co-published by students in 2018
- Of these 24 articles 29 students were co-authors
- 12 of these articles were first-authored by students
- 5 articles are in press for 2019 with students as first-authors

Student Presentations:

- 44 Presentations made at national and international conferences
- 40 of these presentations, the student was the first Author
- 4 of these presentations were made at international locations

Graduate Student Funding:

- \$121,050 New funding was made directly to students applying for grants
- \$159,000 Recurring funding from students who received multi-year grants
- **\$280,050 Total funding** brought into USF **by students** in 2018

Undergraduate Research Activities involved 22 students as interns and volunteers:

- 13 USFSP students
- 4 Eckerd College students
- 5 students from USF Tampa, St. Petersburg College, Rice University, Brandeis College, and Canada

Undergraduate Teaching:

- 16 sections were taught in 2018
- 478 students were served

Undergraduate Courses taught (Instructor):

- *Introduction to Oceanography* online (Arellano)
- *Introduction to Oceanography*-Tampa campus (Greely)
- *Geological History of Florida* online (Arellano)
- *Marine Aquaculture* online (Main), *Port Sustainability* online (Luther)
- *Coral Biology & Reef Ecology* –St. Pete (Arellano)
- *Scanning Electron Microscopy w/ Lab* –St. Pete (Greco)

The annual GRADUATE STUDENT SYMPOSIUM held on January 12, 2018 in the MSL Conference Room with 15 oral presentations and SEVEN poster presentations.

- First Place Oral Presentation: Katelyn Schockman
- Second Place Oral Presentation: Mengqiu Wang
- Third Place Oral Presentation: Makenzie Burrows
- Best Poster: Chao Liu

DEGREES OFFERED

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

Graduate Certificate in Teaching & Communication Ocean Sciences Broader Impacts

GRADUATE PROGRAM

Master of Science (MS) and Doctoral (PhD) degrees in Biological, Chemical, Geological, Marine Resource Assessment (MRA), and Physical Oceanography Concentrations

STUDENTS GRADUATED IN 2018

MASTER'S (8)

Combs, Brittany advised by Cameron Ainsworth, fall, "Quantifying the Probability of the Lethal Injury to Florida Manatees Given Characteristics of Vessel Collision Event"

Creasy, Alexandria advised by Mya Breitbart and Larry Dishaw, summer, "Diversity of ssDNA Phages Related to the Family Microviridea Within the *Ciona Robusta* gut"

Davis, Katie advised by Steve Murawski, fall, "Use of a Towed Camera System Along the West Florida Shelf: A case study of the Florida Middle Grounds Benthic Marine Communities"

Gfatter, Christian advised by Pam Hallock Muller, fall, "Application of Image Recognition Technology Foraminiferal Assemblage Analyses"

Gray, John advised by David Naar, spring, "The Stability of Sand Waves in a Tidally Influenced Shipping Channel, Tampa Bay, Florida"

Ilich, Alexander advised by Steve Murawski, fall, "Integrating Towed Underwater Video with Multibeam Acoustics for Mapping Benthic Habitat and Assessing Reef Fish Communities on the West Florida Shelf"

Martin, Makenna advised by Pam Hallock Muller, summer, "Microbial Associations of four Species of Algal Symbiont-bearing Foraminifera from the Florida Reef Tract, USA"

Reynolds, Caitlin advised by Brad Rosenheim, summer, "Environmental Controls on the Geochemistry of *Globorotalia Truncatulinoides* in the Gulf of Mexico: Implications for Paleooceanographic Reconstructions"

PhD's (15)

Birk, Matthew advised by Brad Seibel, summer, "Ecophysiology of Oxygen Supply in Cephalopods"

Brown, Elizabeth advised by Pamela Hallock Muller, fall, "Taxonomy and Geochemistry of the Globigerinoides Ruber-elongatus Plexus, and Paleontological Implications"

Chen, Shuangling advised by Chuanmin Hu, fall, "Remote Estimation of Surface Water pCO₂ in the Gulf of Mexico"

Cockrell, Marcy advised by Steve Murawski, spring, "Spatial Dynamics and Productivity of a Gulf of Mexico Commercial Reef Fish Fishery Following Large Scale Disterbance and Management Change"

Dornberger, Lindsey advised by Cameron Ainsworth, summer, "Using Ecosystem Based Modeling to Describe an Oil Spill and Assess the Long-Term Effects"

Douglas, Nora advised by Bob Byrne, spring, "Extending Spectrophotometric pH_T Measurements in Coastal and Estuarine Environments"

Drexler, Michael advised by Cameron Ainsworth, fall, "Evaluating the use of Larval Connectivity Information in Fisheries models and Management in the Gulf of Mexico"

GRADUATE PROGRAM

Freytes-Ortiz, Ileana advised by Chris Stallings, summer, “An Interdisciplinary Approach to Understanding Predator-Prey Relationships in a Changing Ocean: From System Design to Education”

Granneman, Jennifer advised by Ernst Peebles and Steve Murawski, summer, “Evaluation of Trace-metal and Isotopic Records as Techniques for Tracking Lifetime Movement Patterns in Fishes”

Haller, Christian advised by Pam Hallock Muller, spring, “Application of Modern Foraminiferal Assemblages to Paleoenvironmental Reconstruction: Case Studies from Coastal and Shelf Environments”

Laureano-Rosario, Abdiel advised by Frank Muller-Karger, summer, “Evaluating Beach Water Quality and Dengue Fever Risk Factors by Satellite Remote Sensing and Artificial Neural Networks”

Ross, Benjamin advised by Pam Hallock Muller, fall, “Dormancy in the Amphistegina Gibbosa Holobiont: Ecological and Evolutionary Implications for the Foraminifera”

Smith, Elizabeth Herdter advised by Steve Murawski, fall, “Exploring Variability in Population Dynamics and the Influence of Environmental Factors on Recruitment of an Estuarine Fish”

Sun, Shaojie advised by Chuanmin Hu, fall, “Optical Remote Sensing of the Oil Spills in the Gulf of Mexico”

Wang, Mengqiu advised by Chuanmin Hu, summer, “Spatial and temporal distributions of pelagic Sargassum in the Intra-Americas Sea and Atlantic Ocean”

ENDOWED GRADUATE STUDENT FELLOWSHIPS

On October 5, 2018, CMS recognized fellowship and award recipients and their generous supporters at the 7th Annual College of Marine Science Fellowships and Awards Luncheon held at the Duke Energy Center for the Arts – The Mahaffey Theater. Through the leadership of Dean Jacqueline Dixon and former Deans Peter Betzer and William Hogarth, our \$20 million endowment provides ~\$408,000 per year that supports endowed fellowships to 29 graduate students and \$3K per year for three special awards. The luncheon is a fun, festive event that provides an opportunity for fellowship and award recipients to meet the individuals and families who helped to make it possible for these students to pursue a degree at the CMS.



2018-2019 Endowed Fellowship Recipients

GRADUATE PROGRAM

The 2018-2019 Endowed Fellowships were provided to the following students:

- Alyssa Marie Andres** - Garrels Memorial Fellowship in Marine Science
- Thea Bartlett** - Anne & Werner Von Rosenstiel Fellowship in Marine Science
- Gabriel A. Browning** - William and Elsie Knight Endowed Fellowship Fund for Marine Science
- Shannon Burns** - Southern Kingfish Association's Fellowship
- Makenzie Burrows** - William T. Hogarth Fellowship in Marine Mammals
- Shuangling Chen** - George Lorton Fellowship in Marine Science
- Marcy Cockrell** - Oceanography Camp for Girls Fellowship
- Kate Dubickas** - Oceanography Camp for Girls Fellowship
- Meaghan E. Faletti** - Tampa Bay Parrot Head Fellowship in Marine Science
- Adrienne P. Hollister** - Carl Riggs Fellowship in Marine Science
- Minghai Huang** - Anne & Werner Von Rosenstiel Fellowship in Marine Science
- Ellie Hudson-Heck** - Young Fellowship Program Fund
- Loraine Martell-Bonet** - Bridge to the Doctorate Endowed Graduate Fellowship
- Travis Mellett** - Sanibel-Captiva Shell Club / Mary & Al Bridell Memorial Fellowship
- Garrett L. Miller** - Wells Fargo Fellowship in Marine Science
- Bich Vi Viviane Nguyen** - Gulf Oceanographic Charitable Trust Fellowships Endowment
- Jonathan Peake** - Linton Tibbetts Endowed Graduate Student Fellowship
- Catherine Prunella** – Thomas E. Pyle Memorial Fellowship in Marine Science
- Carey Schafer** - Paul Getting Endowed Memorial Fellowship in Marine Science
- Katelyn Schockman**- St. Petersburg Downtown Partnership Fellowship in Coastal Science
- Madison Schwaab** - Anne & Werner Von Rosenstiel Fellowship in Marine Science
- Rebecca Scott** - Anne & Werner Von Rosenstiel Fellowship in Marine Science
- Julie Vecchio** - Jack and Katharine Ann Lake Fellowship in Marine Science
- Ryan A. Venturelli** - Gulf Oceanographic Charitable Trust Fellowships Endowment

Also recognized were achievements of students, alumnae, and researchers through the Renate E. Bernstein Outstanding Authorship Award, the Sackett Prize for Innovative Research Fund, and the David K. Costello Award for Interdisciplinary Engineering. The 2018-2019 Award Recipients:

- Steve Butcher** – David K. Costello Award for Interdisciplinary Engineering
- Jacqueline Long** – Sackett Prize for Innovative Research Fund
- Travis Mellett**– Renate E. Bernstein Outstanding Authorship Award

OTHER STUDENT HONORS, AWARDS, AND ACHIEVEMENTS

In 2018, there were 18 external awards (including an honorable mentions) totaling \$121,050. There were also multiyear awards from previous years whose 2018 funding totaled \$159,000. **Combined, the students brought in \$280,050 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

GRADUATE PROGRAM

insurance covered, but those amounts are not shown in the award amounts totaled above or listed below.

2018 STUDENT EXTERNAL AWARDS

Kyle Amergian: 2018 Joseph A Cushman Award for Student Research (\$2000)

Makenzie Burrows: WLP Dorothy L. Morgan Endowed Scholarships in Marine Science Awarded at the Women in Leadership & Philanthropy (WLP) Reception (\$1000)

Shannon Burns: Awarded \$1800 to fund an exploratory study of the distribution of bioactive trace metals in surface waters of Tampa Bay. Paid for ship time.

Dinorah Chacin: McKnight Doctoral Fellowship (\$12,000/yr for 5 years, year 5)

Cara Estes: 2016 Gulf of Mexico Coastal Ocean Observing System Fellowship (\$20,000/yr for 3 years)

Meaghan Faletti: Fish Florida Scholarship 2018 (\$10,000)

Meaghan Faletti: Roger Rottman Memorial Scholarship - American Fisheries Society Florida Chapter (\$1,000)

Meaghan Faletti: American Fisheries Society Florida Chapter Meeting Travel Grant (\$250)

Savanah Hartman: McKnight Doctoral Fellowship (\$12,000/yr for 5 years, year 1)

Michelle Guitard: McKnight Doctoral Fellowship (\$12,000/yr for 5 years, year 5)

Chao Liu: 2018 NASA Earth and Space Science Fellow. The NASA Earth and Space Science Fellowship (NESSF) program had 424 applications in Earth Science and only 54 were selected (\$45,000 per year, renewable up to two additional years)

Jonathan Peake: 2018 Florida Forage Fish Research Fellowship (\$15,000)

Dylan Peck: USF Graduate Student Success Fellowship (\$16,000)

Bryan O'Malley: USF University Graduate Fellowship (\$8,000)

Brent Summers: 2018 National Science Foundation Graduate Research Fellowship Program Honorable Mention

Luis Lizcano Sandoval: Fulbright Scholar

Shaojie Sun: NASA Earth and Space Science Fellowship (\$45,000 Renewal)

Kara Vadman: National Science Foundation Graduate Research Fellowship Program (\$32,000/year)

Kelly Vasbinder: USF Presidential Fellowship (\$25,000/yr renewable for 5 years)

OUTSTANDING RESEARCH/PRESENTATION AWARDS

Mary Abercrombie: FGCU Grant-in-Aid Award for completion of PhD Dissertation

Rebekka Larson: 2018 James D. Watkins Student Award for Excellent Research, by the Consortium for Ocean Leadership

Theresa King: 2018 USF Graduate Student Research Symposium winning poster entitled "Antarctica in Hot Water: Employing a Suite of Archives and Techniques to Understand the Melting Continent." This earned Theresa the chance to represent USF at the 5th Annual Statewide Graduate Student Research Symposium

2018 EVENTS IN THE NEWS OR ON THE WWW.MARINE.USF.EDU WEBSITE

Mengqiu Wang: Obtained her PhD with three papers published and two papers in-press

GRADUATE PROGRAM

Michelle Guitard: Invited to join the Shipboard Scientific Party of International Ocean Discovery Program (IODP) Expedition 382 to the Scotia Sea, in the Atlantic Sector of the Southern Ocean for a 2- month expedition (March -May 2019). <https://www.marine.usf.edu/news-and-events/ph-d-student-michelle-guitard-invited-to-sail-on-iodp-expedition-382-to-the-southern-ocean/>

Matthew Birk: Accepted a position as a postdoctoral scientist at the Marine Biological Laboratory in Woods Hole, MA. <https://www.marine.usf.edu/student-awards-and-highlights/matthew-a-birk-accepts-position-as-a-postdoctoral-scientist/>

Matt McCarthy published an op-ed in *Tampa Bay Times* following up a very successful visit by Dr. Luther's Ocean Policy class to Capitol Hill, during the 2018 Oceans Week. The title of the of the mid-June 2018 article was entitled, *House won't move on bill because it's 'not sexy'*, which was a bill focused on taking care of the ocean health, and was called, "The Save Our Seas Act." It had broad support, and eventually, the bill was passed.

Marcy Cockrell: Selected as a Fellow for the 2018-2019 class with the National Academies of Sciences, Engineering, and Medicine for the Gulf Research Program. <http://www.nationalacademies.org/gulf/fellowships/science-policy/index.htm>

Kate Dubickas: Featured as the TOS Student Member Highlight in the January 2018 student newsletter from The Oceanography Society. <https://www.marine.usf.edu/news-and-events/cms-student-featured-in-oceanography-student-newsletter/>

Chao Liu: Selected by the NASA Earth and Space Science Fellowship program. <https://www.marine.usf.edu/student-awards-and-highlights/chao-liu-selected-by-the-nasa-earth-and-space-science-fellowship-program/>

Theresa King: Selected and sailed on IODP Scientific Drilling Expedition 379 within the Amundsen Sea near Antarctica. <https://www.marine.usf.edu/student-awards-and-highlights/phd-student-to-sail-on-iodp-expedition-379-to-amundsen-sea-antarctica/>

Theresa King: Selected a winner in the poster presentation category at the USF Graduate Student Symposium. <https://www.marine.usf.edu/news-and-events/theresa-king-wins-poster-presentation-at-the-usf-graduate-student-symposium/>

Ryan Venturelli: Received 2018 Graduate Student Research Grant from the Geological Society of America for her research project entitled, "Deconvolving Holocene Hydrologic Variability along the Florida Keys Reef Tract." <https://www.marine.usf.edu/news-and-events/ryan-venturelli-receives-a-2018-gsa-graduate-student-research-grant/>

Brent Summers: Selected and sailed on the US GEOTRACES North Pacific Cruise. <https://www.marine.usf.edu/student-awards-and-highlights/usf-student-brent-summers-to-sail-on-us-geotraces-north-pacific-cruise/>

Anni Djurhuus, Natalie Sawaya, Natalia Lopez, and Kema Malki: Graduate Students presented their research at the Aquatic Virus Workshop. <https://www.marine.usf.edu/student-awards-and-highlights/graduate-students-presented-their-research-at-the-aquatic-virus-workshop/>

Jonathan Peake: *For Answers on Florida's Little Fish, a Math Geek Dives Into Data* A doctoral student studied prey and predators to better understand estuary food webs.

<https://www.pewtrusts.org/en/research-and-analysis/articles/2018/09/19/for-answers-on-floridas-little-fish-a-math-geek-dives-into-data>

2018 STUDENT PUBLICATIONS (WITHOUT FACULTY CO-AUTHORS – REMAINDER OF STUDENT ARTICLES ARE WITH FACULTY PUBS)

Marcy Cockrell (alumna), **Kate Dubickas**, **Megan Hepner**(alumna), **Alex Ilich**, and **Matt McCarthy** (alumnus) (2018) Embracing Advocacy in Science. *Fisheries*, 43(4), 179-182 – (an article in *Fisheries* encouraging scientist and science-minded citizens to participate in science advocacy.)

Kate Dubickas and **Alexander Ilich**: "Becoming an Ocean Advocate through Experiential Learning" published in *Oceanography* Volume 30 Issue 04, focuses on their time and experiences in the Ocean Policy class.

Wen, Y., **Wang, M.**, Lu, Y., **Sun, S.**, Zhang, M., Mao, Z., & Liu, Y. (2018) An alternative approach to determine critical angle of contrast reversal and surface roughness of oil slicks under sunglint. *International journal of digital earth*, 11(9), 972-979.

Kilborn (alumnus), J. P., **Drexler, M.**, & Jones, D. L. (2018) Fluctuating fishing intensities and climate dynamics reorganize the Gulf of Mexico's fisheries resources. *Ecosphere* 9(11), e02487.

Fordham, B. G., Aze, T., **Haller, C.**, Zehady, A. K., Pearson, P. N., Ogg, J. G., & Wade, B. S. (2018) Future-proofing the Cenozoic macroperforate planktonic foraminifera phylogeny of Aze & others (2011) *PloS One*, 13(10), e0204625.

Chubb, C., Chiao, C. C., Ulmer, K., Buresch, K., **Birk, M. A.**, & Hanlon, R. T. (2018) Dark scene elements strongly influence cuttlefish camouflage responses in visually cluttered environments. *Vision Research* 149, 86-101.

Birk, M. A. (2018) *Respirometry*: Tools for conducting and analyzing respirometry experiments. R package, version 0.7. 0, URL: <http://cran.r-project.org/package=respirometry>.

Fu, D., Pu, W., Wang, Z., Lu, X., **Sun, S.**, Yu, C., & Xia, H. (2018) A facile dynamic crosslinked healable poly (oxime-urethane) elastomer with high elastic recovery and recyclability. *Journal of Materials Chemistry A* 6(37), 18154-18164.

Zhang, H., Wang, S., Qiu, Z., Sun, D., Ishizaka, J., **Sun, S.**, & He, Y. (2018) Phytoplankton size class in the East China Sea derived from MODIS satellite data. *Biogeosciences* 15(13), 4271-4289.

2019 PUBLICATIONS IN PRESS:

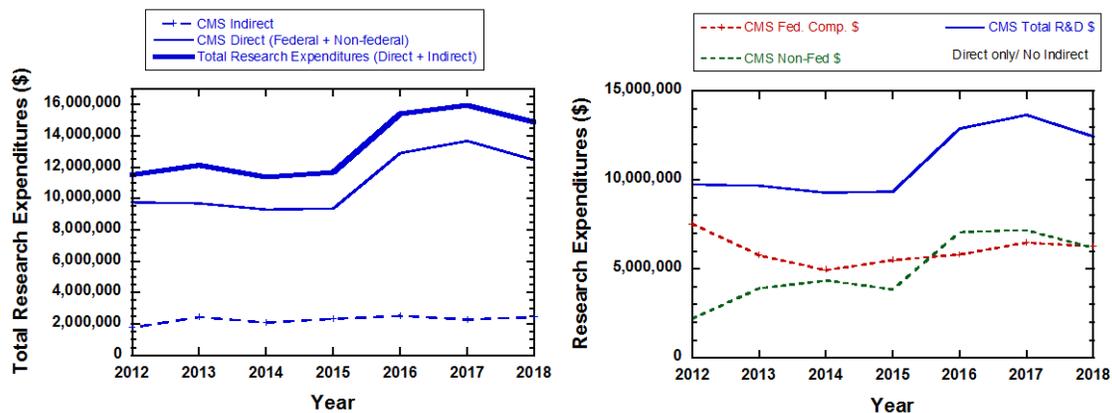
Herdter, E. (2019) Using extreme gradient boosting (XGBoost) to evaluate the importance of a suite of environmental variables and to predict recruitment of young-of-the-year spotted seatrout in Florida. *BioRxiv*, 543181.

CMS Research

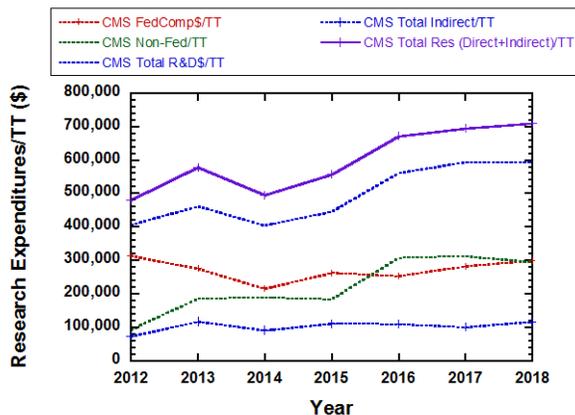
CMS RESEARCH PRODUCTIVITY

CMS faculty, students, and staff published 138 peer-reviewed journal publications, three books, and one patent (Appendix A). Individual grants are listed in Appendix B.

The research profile of the CMS remains strong despite increased competition for external grants in general, and especially stiff competition for federal grants, as we have pointed out in recent years. As the C-IMAGE II project spins down, our non-federal funding numbers will inevitably decrease, but we are holding our own. This is especially noteworthy since our numbers have remained stable even though our number of tenure-track faculty members has decreased since last year's report. On the positive side, we have new faculty hires who will contribute soon.



Our total research expenditures are ~\$14.9 M, with ~\$12.5 M in direct research expenditures and ~\$2.4 M in indirect cost recovery. The dip in the total research expenditures is related to the winding down of the Gulf of Mexico Research Initiative funded C-IMAGE consortium.



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 at nearly \$700,000 even though our number of faculty members decreased.

Highlighted Research

CLIMATE CHANGE AND SEA LEVEL RISE RESEARCH

BY: DR. GARY MITCHUM

Climate change and sea level rise continue to be divisive issues in society despite solid consensus amongst scientists and citizens around the world. In our own country, most people, and the vast majority of scientists, are convinced that the climate is changing, sea levels are rising, the rate of sea level rise is accelerating, and humans have caused the problem. Yet many who are not scientists remain unconvinced. One concern has been that the predictions of accelerating sea level rise are based on climate models rather than climate data. Until we can see it in the data, they say, then why should we believe it? This is a valid concern. We now have the answer.

<https://cires.colorado.edu/news/sea-level-rise-accelerating>.

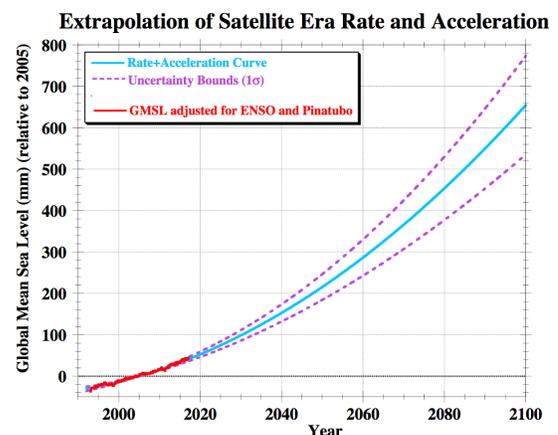
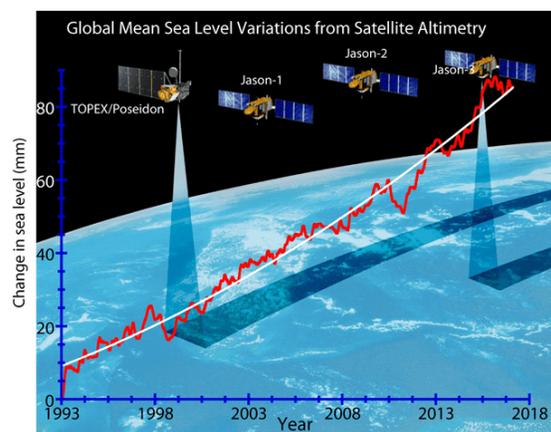
In this paper, Nerem, Mitchum, and co-authors show for the first time that the predicted acceleration in sea level rise can be detected in the satellite sea level observations. Furthermore, the observed magnitude of the acceleration agrees with the prediction of the climate models

(<https://www.pnas.org/content/115/9/2022>). **This is a game-changer**, removing what has been a major objection of climate change skeptics, who say that accelerating climate change trends cannot be seen in the data.

Mitchum and his colleagues have been working on this problem for over 20 years. Time will tell whether this will change the minds of the unconvinced, but in the meantime it has attracted significant visibility in the global news media. The Altmetric Group

(<https://www.altmetric.com/about-us/>) tracks these things and the link for this paper,

<https://pnas.altmetric.com/details/33132767/news> documents 200 news stories from 163 different outlets during 2018. This paper was listed in the top 100 papers in a wide survey of the science articles tracked by Altmetric in 2018, and was the #33 out of 78537 most noticed articles in PNAS, a top journal in our field, in terms of media attention.



HIGHLIGHTED RESEARCH

IT'S ABOUT TIME: A SYNTHESIS OF CHANGING MARINE ECOSYSTEM PHENOLOGY

BY: DR. YUN LI, RESEARCH FACULTY

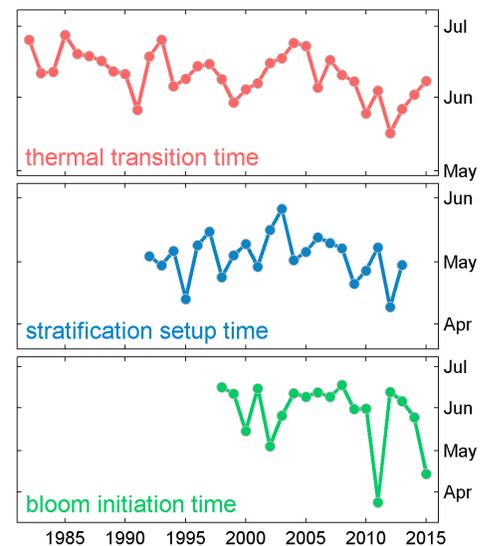
As a part of the Regional Association for Research on the Gulf of Maine (RARGOM) working group, Dr. Yun Li worked with scientists from 19 universities and institutions to synthesize recent advances in our understanding of ecosystem phenology. **Phenology is “the study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life” -- essentially how living things are changing over time.**

Due to climate change and variability, the “seasonal clock” of the marine ecosystem has undergone extensive adjustment. Changes that have already occurred in marine life include but not limited to seasonal timing, duration, speciation and magnitude. Some changes may seem small, but their cumulative effects, through the food chain or other interactions can cascade into disproportionately large impacts on overall ecosystem health and sustainability.

As highlighted in a recent Editorial in *Nature Climate Change*: “Phenological research has made great inroads into revealing the ways in which these changes alter ecosystems, but we have still hardly begun to plumb the depths needed to understand how these interacting effects will play out over the coming decades.” **Climate-induced shifts in marine phenology are, by far, much less documented than in terrestrial ecosystems.** Our knowledge gap about phenological variabilities poses great challenges for marine ecosystem management, calling for effective adaptation strategies to mitigate changes in ecosystem seasonality.

Thanks to satellite measurements and long-term ocean monitoring efforts, marine scientists can now use big data to detect shifts in the timing and amplitude of ecological responses, such as earlier spring warming events and the timing of the lobster harvest. At a fundamental level, **Dr. Li seeks to understand how shifts in the timing and frequency of ocean’s heartbeat** (a.k.a., ocean stratification) modulate the environmental resources for phytoplankton growth and its impacts on higher trophic level organisms and the marine carbon cycle. Her ongoing work in the Northwest Atlantic Shelf region provided one part of baseline information for the working group.

Her paper recently published in *Fisheries Oceanography*, titled “*It’s about time: A synthesis of changing phenology in the Gulf of Maine ecosystem*”, uses the Gulf of Maine as an ideal testbed, because this ecosystem is highly seasonal and is experiencing warming at a rate 2-3 times faster than other parts of the global ocean. The goal is to provide synergistic documentation of 1) key seasonal processes, patterns and events; 2) direct evidence for shifts in timing; 3) implications of phenological responses for linked ecological-human systems; and 4) potential phenology-focused adaptation strategies and actions.



Data-derived timings of environmental factors and phytoplankton bloom in the Gulf of Maine

NUTRIENT EXCESS AND THE DEMISE OF CORAL REEFS AND CARBONATE PLATFORMS

BY: DR. PAM HALLOCK MULLER

We learned in 2018 that one of Professor Pamela Hallock Muller's papers published in 1986 in the journal *Palaios* (Hallock Muller and W. Schlager) was designated as one of the **Landmark Papers in Carbonate Sedimentology and Stratigraphy** by the American Association of Petroleum Geologists (AAPG). The AAPG 100th Anniversary Committee compiled lists of papers considered to be the most influential papers in the different disciplines in petroleum geology. According to the website, these lists include **"the seminal papers that introduced concepts that are now routinely used by geoscientists."**

Professor Muller was also notified this year that the Society for Sedimentary Geology (SEPM) selected her to receive the Raymond C. Moore Medal for Excellence in Paleontological Research, to be awarded at the AAPG-ACE meeting in San Antonio Texas, in May 2019. These are great honors for Pam and we asked her to share more about what led to her highly influential 1986 paper.

Here's her response:

Forty years ago, statements such as "Coral reefs are among the most productive ecosystems on Earth and they are found in clear, nutrient-rich tropical seas" were commonly seen in textbooks and heard at scientific meetings. As a graduate student in Oceanography at the University of Hawai'i and soon thereafter, as an Assistant Professor of Earth Sciences at a small university in the heart of the West Texas "Oil Patch," I cringed every time I heard or read something like that.

At a lunch-time seminar sponsored by the West Texas Geological Society, the speaker, who was an AAPG Distinguished Lecturer, began his talk with slides showing beautiful Australian corals in crystal-clear waters ... and those words. The rest of the presentation was outstanding, but after the talk when I had the opportunity to meet the speaker, I asked, "If reef waters are so nutrient rich, how can they be so clear?" The speaker (who later became a collaborator) responded simply, "I shouldn't say that, should I?"

As a graduate student, I began studying foraminifera. The shells produced by these organisms are a major component of the calcium-carbonate sediments that cover approximately one-third of the Earth's surface. The most prolific producers of these sediments are foraminiferal species that host algal cells within their own cells, and this symbiotic relationship is analogous to that of reef-building corals and their algal symbionts. Beginning with my master's thesis project, I focused on understanding the environmental conditions that promote copious production of carbonate shells and skeletons, including the role of the algal symbionts.

In my first faculty position **I became ever more aware of the misconceptions many geologists, and even reef biologists, had about reefs and the limestones that reefs have produced through Earth's history.** As something of an outsider, I decided to focus on the highly productive shell production by the larger benthic foraminifera. These shells make up about 25% of the beach sand around the island of O'ahu and as much as 95% of the sands on Pacific coral islands and atolls. Fortunately for me, some

HIGHLIGHTED RESEARCH

geologists were interested in my early work because limestones that formed during certain times in Earth history were dominated by the fossil shells of such foraminifera.

These concepts were brought to fruition during my first years at USF. I did what I tell my graduate students to do, “When you have an idea in which you are confident, don’t be discouraged by rejections.” Earlier versions of my paper were rejected by three well-known journals as being speculative or not of general interest. But I was not discouraged. As word spread about these ideas, a leading carbonate sedimentologist, Wolfgang Schlager, contacted me and suggested that we collaborate. The concepts I proposed provided strong support for his 1981 paper (also selected as one of the “**Landmark Papers in Carbonate Sedimentology**”), and the journal *Palaio* published my paper with Wolfgang.

I am very proud of this paper, which is approaching 1000 citations, including at least 20 over the past year, 33 years after the original publication. I would also point out that only 2–3 papers per year attract citation rates of more than 20/year. Despite the early rejections by editors of major journals, recognition has come. And it is not surprising. The concepts presented in this paper are applicable to limestones found around the world, including rocks formed during the last 500 million years of Earth history and also modern coral reefs and carbonate beach systems. When I’m asked about my long-standing interest in reefs and limestones, I say, “Limestones are major reservoirs of hydrocarbons, they provide the aquifers that provide us water, and they are major sources of construction materials. What scientist would **not** be interested?”



Pam Hallock Muller at work in her office.

HIGHLIGHTED RESEARCH

USF-LED TEAM DEPLOYS TSUNAMI BUOY TEST IN TAMPA BAY

BY: JAY LAW, CHAD LEMBKE AND DR. TIMOTHY DIXON

The tragic earthquake/tsunami sequences of 2004 in Sumatra and 2011 in Japan were catastrophes that produced respectively the most fatalities and the largest financial losses from a natural disaster in recent history. **They were also wake-up calls that the science community has not been very successful at forecasting these tragic events. A USF-led research team is hard at work addressing this knowledge gap, recently deploying the first Shallow Underwater Buoy for Geodesy (SUBGEO) as part of a 3-year NSF project designed to measure seafloor deformation in coastal areas prone to earthquakes and tsunamis.**

This collaborative project between the USF School of Geosciences and the USF College of Marine Science (CMS) is made possible through an NSF-OTIC (Ocean Technology) grant to develop a high precision sea floor geodetic system suitable for shallow coastal regions. The system is designed for subduction zone applications – areas such as the Pacific “ring of fire” where oceanic crust is forced underneath less dense continental crust. Frictional resistance to this subduction causes strain to accumulate; when this strain is released, violent consequences result, in the form of earthquakes and tsunamis.



While GPS provides good strain measurements on land, the critical zone of strain accumulation in subduction zones often lies offshore. Making precise measurements here is complicated by the fact that the seafloor lies beneath a large volume of uncooperative fluid – the coastal ocean.

Enter SUBGEO - a spar buoy system with a GPS antenna above the waves anchored rigidly to a massive sea floor ballast. A large float provides buoyancy just beneath the surface (the yellow “doughnut” in the picture above). SUBGEO’s final design was achieved in close collaboration with INGV-Italy, the government agency charged with volcano hazard assessment that maintains a similar system offshore Mt. Vesuvius (which destroyed the Roman town of Pompeii in AD 79).

The experiment is a collaboration between USF, including CMS’ Machine Shop and Ocean Technology Group, Hydra Solutions of Italy (who provided design expertise) and Tampa’s Loupin Construction (ballast design and construction) and Orion Marine Group (deployment). On August 23, 2018 the buoy was successfully deployed near Egmont Key with support from the Florida Institute of Oceanography.

The system is performing well, and currently **transmits both vertical and horizontal seafloor movements to an accuracy of 1 cm in real-time to researchers on shore through a satellite link. The SUBGEO team is now leveraging additional funding for the next step in this exciting project – a long term deployment in an active subduction zone.** Recent proposals have targeted the Pacific region off

HIGHLIGHTED RESEARCH

of the west coast of Central America. Once SUBGEO is deployed in the field these precise measurements of sea floor motion will be put to their intended use - to improve forecasting ability, especially for the largest tsunamis, which are the real killers.



For more information, check out our project web site:
<http://labs.cas.usf.edu/geodesy/> (click on the “Research Projects” button)

USF UNDERWATER GLIDER BRINGS CLARITY TO ‘RED’ WATERS IN THE SUMMER OF 2018

WRITTEN BY: SEAN BECKWITH

RESEARCH BY: CHAD LEMBKE, DR. YONGGANG LIU, AND DR. ROBERT WEISBERG

What would become one of the longest and most intense red tide blooms on record was just getting into full swing during the summer of 2018. A bloom had lingered south of Venice, Florida since October of 2017. With reports of respiratory ailments at the beach and reactions from civic leaders intensifying throughout the 2018 summer, CMS leapt into action.

Dean of Research at CMS, Dr. Gary Mitchum, conferred with Dr. Robert Weisberg, Distinguished Professor of Physical Oceanography, a veteran of predicting seasonal red tide blooms and forecasting their movements. The two decided that deploying a profiling underwater glider would be the best, and most cost effective, way to understand what might be lurking offshore. Were concentrations of *Karenia brevis* (*K. brevis*), the organism responsible for red tide, increasing in the deeper, offshore water?

As we look back now on what became a rather devastating outbreak of red tide, the importance of an early-warning system is abundantly clear. As for earthquakes and hurricanes, a harmful algal bloom early warning system is of immense societal value. In the particular case of 2018, Tropical Storm Gordon actually pushed some of the *K. brevis* cells northward to initiate a bloom along the coast in the Panhandle, and continuous upwelling after the storm swept portions of the main bloom southward, around the Straits of Florida and then north along the east coast of Florida. The ocean

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circulation and wind-driven currents, in a rare event, conspired to produce simultaneous red tide events on all three of Florida's coasts.



Caption: A USF glider deployed to measure water quality proxies for red tide.

Oceanographic buoys and weather monitoring stations across the west Florida shelf were feeding models that, in conjunction with water sampling data collected by the FWC Fish and Wildlife Research Institute (FWRI), provided 3.5-day forecasts of red tide trajectories. **What was needed in the summer of 2018, was a more thorough look at actual conditions in the offshore subsurface waters – the “formative” region where red tide blooms are believed to originate.**

Equipped with a suite of sensors for temperature, salinity, depth, dissolved oxygen, and chlorophyll, and capable of making several dives and ascents each day for multiple weeks, gliders provide the depth of data that the CMS team was looking for.

With their orders in hand, Chad Lembke and fellow engineers and researchers in the CMS Ocean Technology Group (COT), started working overtime (including weekends) to prepare the Teledyne Webb Research Slocum glider they had customized for similar operations in the past. Lembke had been through a few red tide rodeos before, and he knew exactly the specifications Weisberg wanted in order to obtain the data they needed from offshore waters of the middle west Florida shelf.

After tweaking the glider and making the necessary ballast adjustments for the weight of the replacement battery packs, COT launched the glider on August 24th, 2018, from an FWRI research boat with a crew of red tide scientists who were on board to take water samples from the initial point of deployment. The hard work and extra hours paid off big by presenting researchers with an

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opportunity to investigate the potential of the lingering bloom intensifying along the coast at the time of year when new blooms typically occur.

Dr. Yonggang Liu, a Research Associate at CMS and primary collaborator with Weisberg on red tide, explained that the Ocean Circulation Group wished to know whether there were still a lot of *K. brevis* cells out on the shelf that might be transported towards our coast or if the *K. brevis* cells concentration was low enough to conclude that the threat was gone, or at least diminishing.

A zig-zagging track line that worked its way south along the mid-shelf would allow the glider to measure water properties in the region hypothesized to contain the originating blooms of *K. brevis*, the organism responsible for red tide. Under the right conditions, and through a number of factors that include prey sources and additions of iron from wind-blown African dust, *K. brevis* is able to outcompete faster growing phytoplankton here in the nutrient-replete offshore waters. Sort of a Goldilocks situation, a lack of upwelling might not provide enough nutrients for *K. brevis* while too much upwelling allows faster growing organisms to outcompete *K. brevis* by feasting on the abundant nutrient supply.

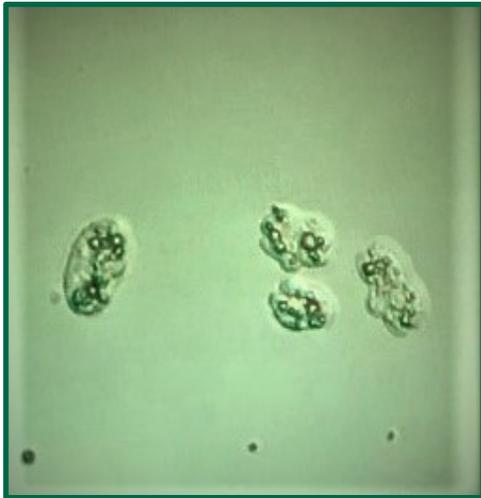
2018 provided the perfect upwelling storm – which, more specifically, involved minimal upwelling of deep waters throughout the early part of the year (allowing *K. brevis* to thrive), followed by strong upwelling occurring in the summer months (owing to positioning of the Loop Current) and, subsequently, transporting the new blooms of *K. brevis* directly to the coastline, resulting in the worst possible scenario for residents and visitors seeking sub-tropical paradise along Florida's gulf coast.

As Weisberg and Liu had predicted, based on the position of the Loop Current in the early months of the year, 2018 became a bad year for red tide. As further evidence of their predictive capabilities, a hindsight analysis reveals that their approach has correctly predicted a major bloom or lack of a major bloom in 20 of the past 25 years simply on the basis of ocean circulation.

For all their technology, the gliders do not yet possess the means to confirm the presence (or absence) of *K. brevis* cells in the water. There is no micro-lab of robots inside a glider analyzing water samples for the microscopic *K. brevis*. Instead, scientists rely on the optical backscatter and chlorophyll instrumentation on board the glider to tease out the likely concentration of *K. brevis* in the water. And the data showed the right ratio of chlorophyll and backscatter near the bottom. Weisberg and Liu used the data in their numerical model to track the water particles' transport pathways. What the results showed, out in 2019 in a scientific publication, was a likely red tide bloom making its way along the bottom where cool, salty waters upwelling from the deep had taken hold of the bloom and begun transporting it towards the central west Florida coast.

The high chlorophyll and low oxygen seen at certain points along the bottom of the glider profile graphs was indicative of respiration and/or oxidation of decaying organic matter. The depths of the apparent red tide hot spots were, as suspected, right along the mid-shelf, at a depth of 30–40 meters near the bottom. Alone, these signs do not confirm the presence of a bloom, but water samples taken during the glider deployment did indeed corroborate the likelihood of a *K. brevis* bloom.

HIGHLIGHTED RESEARCH

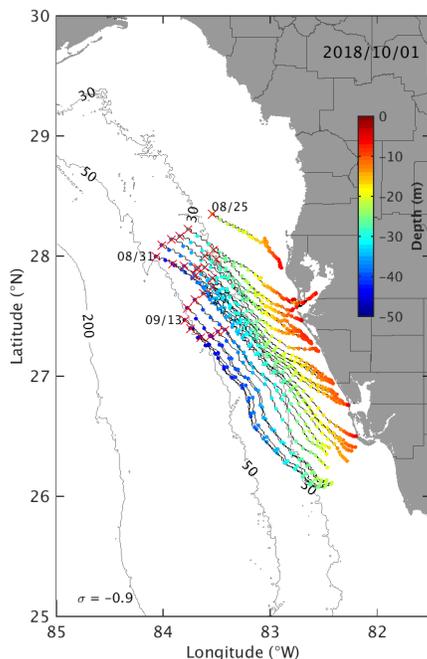


This information was exactly what researchers needed to make the media and public aware of a potential onslaught as the offshore bloom would inevitably join up with the existing coastal bloom to create a formidable problem.

Gliders and offshore buoys make predictions of the onset and evolution of red tides more accurate. Outfitted with nutrient sensors or high resolution acoustics, particularly further to the north in the area believed to be the origin of most major blooms, these tools could provide researchers at CMS with the kind of data needed to really bring red tide prediction to the next level.

A computer monitor displays what a microscopist is seeing as she counts Karenia brevis cells collected in a water sample. Photo courtesy of FWC FWRI.

In the case of last year's bloom, one glider went a long way in helping to understand where red tide forms, how it moves, and, quite importantly, which *direction* it is moving.



Trajectories for water particles initialized along the glider track from 24 August 2018 to 17 September 2018. The modeled trajectories begin with water particles near the bottom and the daily color-coding shows their actual depth as they travel towards the coast. Figure from “The Coastal Ocean Circulation Influence on the 2018 West Florida Shelf K. brevis Red Tide Bloom,” published in preliminary form 25 March 2019.

Faculty Highlights

FACULTY AWARDS:

- **Robert Byrne:** US Patent on Acid-free Measurements of Total Alkalinity (Co-Inventor Dr. Sherwood Liu)
- **Don Chambers:** Promotion to USF CMS Professor
- **Xinfeng Liang:** Sloan Research Fellow in Ocean Sciences and NASA New Early Career Investigator Award in Earth Science
- **Pamela Hallock Muller:** 1986 paper in *Palaos* recognized as one of the “Landmark Papers in Carbonate Sedimentology and Stratigraphy” by the American Association of Petroleum Geologists, 100th Anniversary Committee; 2018 Kosove Foundation USF Distinguished Graduate Teaching and Service Award; Society for Sedimentary Geology (SEPM) announced that she was chosen to receive the 2019 Raymond C. Moore Medal for Excellence in Paleontological Research
- **Frank Muller-Karger:** Fellow, American Association for the Advancement of Science
- **Amelia Shevenell:** Elected as the Geological Oceanographer Councilor to The Oceanography Society’s Governance Council by The International Oceanographic Community

TENURED AND TENURE-TRACK FACULTY ANNUAL UPDATES:

Below are select 2018 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)

Three students graduated from Dr. Ainsworth’s laboratory in 2018: Brittany Combs (MS), Lindsey Dornberger (PhD) and Mike Drexler (PhD). Ainsworth and his team also completed significant synthesis work of the C-IMAGE project, a culmination of effort that began in 2011 in response to the oil spill. Highlights include 1.) a paper published in *PLoS One* (Ainsworth et al. 2018) that shows ecosystem-level impacts of the Deepwater Horizon oil spill (DWHOS), 2.) a chapter in a Springer book published by his Research Associate (Ortega-Ortiz et al.) that compares the Deepwater Horizon Oil Spill (DWHOS) with the 1979 IXTOC spill, and 3.) a PhD Dissertation (Dornberger) that evaluates DWHOS impacts on fish and the benthic biota. Dornberger’s work showed surprising evidence for benthic enrichment at low-to-intermediate levels of oil exposure. The IXTOC study agreed, and to some degree, this exonerates IXTOC as a contributing factor in the Campeche Bay shrimp fishery collapse of the 1980s. It points towards overfishing as the root cause of the collapse.

Ainsworth is increasingly involved in sustainable fisheries governance at the state, federal and international levels. In 2018, he joined an expert panel convened by Louisiana’s Coastal Protection and Restoration Authority in support of the environmental impact review for Mississippi River sediment diversions. He also was elected to the Ecosystem Science and Statistical Committee of the Gulf of Mexico Fisheries Management Council, and the UN Pool of Experts, a body accountable to the

FACULTY HIGHLIGHTS

United Nations General Assembly that supports global reporting and assessment of the state of the marine environment.

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

Dr. Mya Breitbart's microbial ecology and genomics laboratory had an extremely successful year, publishing 15 peer-reviewed scientific manuscripts and accomplishing several major goals on federally-funded projects. Major achievements included: 1) Using viral metagenomics to identify and describe the viral communities in a variety of environments and organisms, 2) Inclusion of DNA barcoding into marine biodiversity surveys, 3) Microbial water quality and risk assessment, 4) Bacteriophage diversity and dynamics in aquatic environments. More information about the Breitbart lab's current research can be heard on a Saint Petersburg Innovation District's podcast (<https://stpetecatalyst.com/podcast-episodes/innovation-in-the-burg-mya-breitbart-and-tee-grizzard/>). Locally relevant research papers published in 2018 included the first description of a virus in seagrass from Tampa Bay, genetic identification of fish eggs in the Gulf of Mexico, biodiversity observations in the Florida Keys National Marine Sanctuary through analysis of environmental DNA, and genome sequencing of a herpesvirus associated with disease in sea turtles. Several of the Breitbart's lab 2018 publications also related to public health, including the use of plant viruses as water quality indicators, descriptions of the types of viruses found in indoor air, and the exploration of a zoonotic viral infection spread from birds to humans. Finally, the Breitbart lab was active in outreach and education, leading several activities for Girls Incorporated of Pinellas, and publishing a paper describing a "Phage Heroes" activity to change the public's negative perception of viruses.



Postdoctoral researcher Anni Djurhuus and PhD student Natalie Sawaya collected DNA samples from the Florida Keys National Marine Sanctuary to examine biodiversity patterns



CMS graduate students created a timeline as part of the inaugural Virology course taught by Mya Breitbart and Karyna Rosario.

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

Dr. Kristen Buck had six active NSF grants in 2018, including four new NSF awards and two additional new non-NSF awards funded in 2018. Her lab group sailed on four research expeditions in 2018

FACULTY HIGHLIGHTS

related to these projects. Buck gave an invited talk in the GEOTRACES town hall at the 2018 Ocean Sciences Meeting, chaired a session and was a co-author on seven presentations. Buck's research was published this year in *Proceedings of the National Academy of Sciences*, *Limnology and Oceanography*, *Chemical Geology*, and *Marine Chemistry*. Buck was the first author on one of these papers and her students were first author on two additional publications in 2018.

Buck currently supervises two PhD students and three MS students. One of these MS students, Chelsea Bonnain, is co-supervised by Dr. Mya Breitbart. Buck also supervised a postdoc and an Eckerd College summer intern, and hosted a visiting scientist from Kuwait in 2018. Buck was the lead instructor of the Chemical Oceanography core course in Spring 2018 and co-taught the course in Fall 2018; Buck also co-taught the Professional Development II course with Mya Breitbart in Spring 2018. Buck continues to serve on the Editorial Board for *Limnology and Oceanography: Letters* as an Associate Editor. She also served for The Oceanography Society as Co-Chair of the 2018 Ocean Sciences Meeting and will be Chair of the 2020 Ocean Sciences Meeting.

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. Byrne received a US patent on acid-free measurements of total alkalinity in 2018 along with co-inventor, Dr. Sherwood Liu. Byrne and his graduated MS student, Erin Cuyler, published a manuscript in *Analytica Chimica Acta* describing calibration-free measurements of calcium carbonate saturation states in seawater. In addition to her first-authored publication, Erin's thesis work resulted in her designation as a co-inventor on a submitted US patent.

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

Dr. Don Chambers was promoted to full Professor last year. He was also recognized by the University of South Florida with an Outstanding Faculty award. Chambers published a study examining whether currents in the Southern Ocean have shifted south in a warming climate. Over the last decade, there has been considerable debate whether this is occurring, as it has implications on several important topics, ranging from penguin foraging to upwelling of warmer water onto the Antarctic shelf. Chambers examined energy of the narrow jets that comprise the fronts of the Southern Ocean and showed that the envelopes of high energy related to the fronts has not shifted south by any measurable degree since 1993. This, along with several other recent studies strongly supports the idea that the fronts will not shift appreciably as they are constrained by interactions with deep seamounts. In another study, Chambers and a USF post-doctoral fellow, Alba Cid Carrera, reconstructed storm surges in southeast Asia from a combination of tide gauge and wind data since 1950. This area of the world has some of the largest potential for dangerous flooding from storm surges as sea level rises, but few observational records on many of the small islands or coastal areas. This study provides a valuable dataset for constructing statistics of flooding probability in a region with large population growth and new construction near the coast.

FACULTY HIGHLIGHTS

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

Since joining the faculty at USF's College of Marine Science and School of Geosciences in 2017, Dr. Tim Conway has continued to expand USF's research capability, finalizing his new clean laboratory and the operation of the USF Tampa Bay Plasma Core Facility in 2018. Establishment of these facilities have already enabled Conway to bring field-leading analytical techniques for measurement of trace metals to USF, hosting collaborative research visits in 2018 for students and scientists from Japan, Switzerland and the Netherlands. During the year, Conway published research on the importance of the circulation of the Gulf Stream for nutrient cycling in the North Atlantic in the prestigious journal *Nature Geoscience*, and was a Lead Guest Editor for *Chemical Geology*, editing a special edition on the International GEOTRACES program in chemical oceanography. Together with other CMS faculty, Conway has been involved in acquisition of a new USF-funded water sampling system for trace metals, which will expand our chemical research capabilities in the Gulf of Mexico, and elsewhere. Conway was also awarded funding by the National Science Foundation Chemical Oceanography Program for the second year running. This state-of-the-art-research grant, in partnership with scientists at Oregon State University, will provide funding for three graduate students, and facilitate research into how trace metals such as iron dissolve from atmospheric dust in the oceans, important for understanding the role of desert dust for ocean biogeochemistry, and productivity, climate change, and events such as red tides.

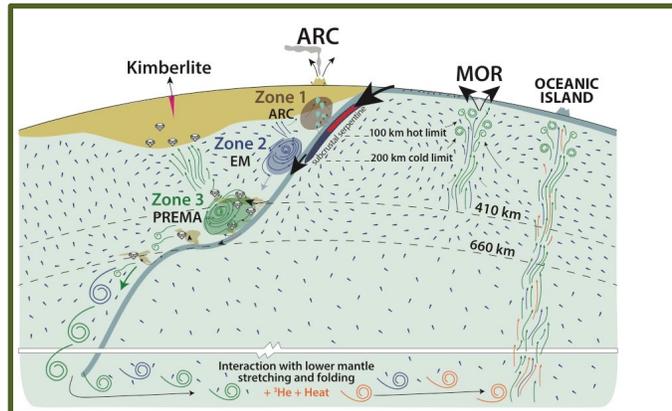
DR. KENDRA DALY (Zooplankton Ecology; Gulf of Mexico and Antarctic Ecosystems; Low Oxygen Regions in the Ocean; Ocean Observatories; Sensor Technology)

Dr. Daly's research focuses on zooplankton ecology with the aim of understanding interactions in the lower trophic food web, including biogeochemical cycles and fisheries oceanography. Currently funded projects include investigations of (1) the lower trophic food web response to the Deepwater Horizon oil spill and (2) the role of marine snow in the sedimentation of Deepwater Horizon oil to the seafloor. In 2018, Daly's PhD student, Claire Crowley, published a series of papers on Florida stone crab life history that will make important contributions to state management practices and fishery evaluations. Stone crabs have been the third most valuable state fishery in recent years. (e.g., *Transactions of the American Fisheries Society*, <http://dx.doi.org/10.1002/tafs.10109>). In addition, Daly's marine snow distributions collected during and after the Deepwater Horizon oil spill were used to validate the first detailed numerical model for predicting the conditions under which marine oil snow aggregates form and the amount of oil they transport to the ocean floor. These were published in the *Journal of Geophysical Research: Oceans*, <https://doi.org/10.1029/2018JC013790>). Numerical modeling of the interactions of oil, marine snow, and riverine sediments in the ocean. Other field data reported in the *Journal of Geophysical Research Oceans* (<https://doi.org/10.1029/2018JC014195>) the showed that West Florida shelf waters have changed from being a weak sink to a weak source of carbon dioxide to the atmosphere over the last 20 years at a rate 2.5 times faster than atmospheric carbon dioxide.

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

In 2018, Dr. Dixon presented her research at the Goldschmidt Conference in Paris and at the American Geophysical Union meeting in Washington, D.C. The talks presented results from her 2017 article in the AGU journal *Geochemistry, Geophysics, Geosystems*, which shed light on recycling of volatiles, such as water and carbon dioxide, into the deep Earth by subduction and out of the deep Earth through eruption and degassing of seafloor volcanoes. Her model improves upon the standard model of subduction, known as the “subduction factory”. Dr. Dixon and her fellow researchers show that water in enriched oceanic basalts is mostly recycled seawater that has been added to the mantle through deep melting of subducted slab igneous crust and sediment



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

A book “Zonal Jets: Phenomenology, Genesis, and Physics,” co-edited by Professor Galperin and Professor Peter L. Read of the University of Oxford, has gone through the review and has been released on 28 February, 2019. This unique, highly interdisciplinary book serves a broad scientific community, from graduate students to experienced researchers. The subject of the book, Zonal Jets, is a phenomenon common to the Atmospheric and Planetary sciences, Oceanography, Astronomy, Plasma Physics, Experimental and Computational Physics, and more. The book surveys both the history and the state-of-the-art, and outlines new directions of research.

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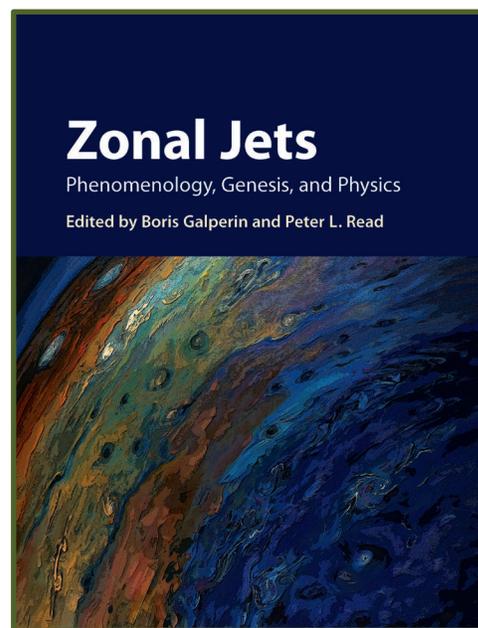
Zonal Jets
Phenomenology, Genesis, and Physics
Edited by Boris Galperin
University of South Florida
and Peter L. Read
University of Oxford

In recent decades, great progress has been made in our understanding of zonal jets across many subjects – atmospheric science, oceanography, planetary science, geophysical fluid dynamics, plasma physics, magnetohydrodynamics, turbulence theory – but communication between researchers from different fields has been weak or non-existent. Even the terminology in different fields may be so disparate that researchers working on similar problems do not understand each other. This comprehensive, multidisciplinary volume will break cross-disciplinary barriers and aid the advancement of the subject. It presents a state-of-the-art summary of all relevant branches of the physics of zonal jets, from the leading experts. The phenomena and concepts are introduced at a level accessible to beginning graduate students and researchers from different fields. The book also includes a very extensive bibliography.

Foreword: Part I. Introduction: 1. The world of jets; Part II. Zonal Jets in Nature: 2. Terrestrial atmospheres; 3. Oceans; 4. Gas giants; 5. Exoplanets and the sun; Part III. Jets in Laboratories: 6. Zonal jet flows in the laboratory: an introduction; 7. Convectively driven turbulence, Rossby waves and zonal jets; experiments on the Coriolis platform; 8. Turbulence, Rossby waves and zonal jets on the polar β-plane; experiments with laboratory anemometry; 9. Zonal jets in laboratory experiments with electromagnetically forced flows; Part IV. Zonal Flows in Magnetically Confined Plasmas: 10. Theory; 11. Experiments; Part V. Genesis and Maintenance of Zonal Jets: Turbulence and instabilities: 12. General results on zonation on rotating systems with a β-effect and the electromagnetic force; 13. Barotropic and zonostrophic turbulence; 14. Zonal jet formation by potential vorticity mixing at large and small scales; 15. Radiating instability; 16. Modulational instability in basic plasma and geophysical models; 17. β-plane mechanisms of creation of zonal jets by a spatially localized forcing; 18. Meridional propagation of zonal jets in ocean gyres; 19. Dynamics of baroclinic multiple zonal jets; Part VI. Genesis and Maintenance of Zonal Jets: Statistical Theories: 20. Statistical closures and zonal flows; 21. Direct statistical simulation of a jet; 22. Zonal flows as statistical equilibria; 23. Zonostrophy and other quadratic invariants in drift and quasi-geostrophic wave turbulence; 24. Kinetic theory and quasilinear theories of jet dynamics; 25. Statistical state dynamics: a new perspective on turbulence in shear flow; 26. Zonal flow as pattern formation; 27. Emergence of non-zonal coherent structures; Part VII. Material Transport in Flows with Jets: 28. Anisotropic and inhomogeneous eddy-induced transport in flows with jets; 29. Turbulence, diffusion and mixing barriers in flows with zonal jets.

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DR. DAVID HOLLANDER (Chemical Sedimentology; Isotopic Biogeochemistry and Organic Geochemistry; Oil Spill Ecosystem Impact Assessment)

David was co-author on 8 peer-reviewed articles, 5 of which have lead authors that are students and staff under his direct supervision. Hollander chaired the MOSSFA (Marine Oil Snow Sedimentation and Flocculent Accumulation) working group and co-organized the MOSSFA workshop in November 2018, as a member of the Gulf of Mexico Research Initiative-Synthesis and Legacy Group focusing on Oil Fate and Degradation. Of significant accomplishment is the pending production of a two-volume series of books being published by Springer of which he served as one of the main editors. These books are entitled: I) *Deep Oil Spills – Facts, Fate and Effects* and II) *Scenarios and Responses to Future Deep Oil Spills – Fighting the Next War* and represent an overview/assessment of the Deepwater Horizon oil spill and a vision for combating future deep-water oil well blowouts, respectively.

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

Dr. Chuanmin Hu graduated 3 PhD students (M. Wang, S. Shao, S. Chen), each having published 6 first-authored papers on topics of *Sargassum* blooms, oil spills, or ocean surface $p\text{CO}_2$. Two of the graduates already received offers of formal academic positions (associate professorship). With an annual expenditure of \$1.2 million from externally supported projects, Hu's Optical Oceanography Lab continued high scholarly productivity. In 2018 his group authored and coauthored 25 refereed papers on a variety of topics in ocean environmental sciences such as oil spills, *Sargassum* blooms, red tides, and coastal water quality changes. Of these, one paper led by his student, M. Wang, developed cutting-edge algorithms to estimate *Sargassum* biomass from space, and established the first historical data record of *Sargassum* biomass in the Caribbean and in the Gulf of Mexico. This research not only paves the pathway for studies of ocean biology, ecology, and bio-physical interactions, but also has significant implications on resource management. Another important breakthrough is their ability to not only detect oil presence on the ocean surface, but also quantify oil quantity.

DR. XINFENG LIANG (Role of Ocean in the Climate System, Influence of Mesoscale Eddies on Deep Ocean Processes, Ocean Mixing and the Associated Dynamical Processes, Ocean Current Measurement and Ocean State Estimates)

In 2018, Dr. Xinfeng Liang was selected as a Sloan Research Fellow in Ocean Sciences. He also received two new NASA grants, including the competitive NASA New (Early Career) Investigator Award in Earth Science. During his third year at the CMS, after recruiting three new graduate students and one postdoc, Liang successfully built a lab of healthy size and structure. Liang devoted most of his research effort exploring new directions under his major theme of the ocean's roles in the climate system. During 2018, in addition to conducting the already funded research, Liang's group started new projects, including 1) describing and understanding the changes in the global ocean salinity; 2) describing and understanding the changes in the global ocean stratification; and 3) the roles of mesoscale eddies in linking the tropical Atlantic and the Gulf of Mexico. One manuscript describing the global salinity changes was reviewed positively in *Nature Communications* and is currently in

FACULTY HIGHLIGHTS

revision. Another related manuscript is currently in preparation for *Journal of Climate*. In addition, Dr. Liang developed a new reading course “The Warming Papers,” which covers many classic papers during the evolution of the climate science and provides students an opportunity to learn climate sciences from a historical point of view.

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

Dr. Mark Luther taught a course in Ocean Policy during Spring 2018 with Frank Muller-Karger. Students in the course published multiple opinion columns and letters-to-the-editor in regional and national media on marine debris, climate change, and fisheries issues. Luther and students attended Capitol Hill Ocean Week in Washington, DC, June 5-8, 2018, where they advocated for marine debris legislation, Magnuson-Stevens fisheries act reauthorization, and the Integrated Coastal Ocean Observation Systems Act reauthorization with members of Congress. This travel was completely funded by USF College of Marine Science discretionary funds and by personal funds. In part, as a result of visits to members of Congress and follow-up op-ed pieces published in the Tampa Bay Times, the Save Our Seas Act (reauthorizing the NOAA marine debris program among other actions) was passed by the House and signed into law by the President in August 2018.

Luther worked closely with the leadership of the International Marine Minerals Society (<https://www.immsoc.org/>) to accomplish the transfer of their headquarters office from the Univ. of Hawaii, where it has resided for more than 20 years, to the College of Marine Science. The transfer should be completed by the fall of 2019, with the IMMS annual Undersea Mining Conference to be held in St. Petersburg in fall 2020 and in even-numbered years thereafter. Luther also was a member of the local organizing committee of the IEEE/MTS Oceans’18 Conference held Oct. 22-25 in Charleston, SC, where he chaired 5 sessions and co-authored 2 papers.

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

Dr. Gary Mitchum continues his work as the USF lead for the Florida Climate Institute (FCI), a consortium of nine Florida universities seeking support for climate-related research. Over the past year, the FCI has been developing a proposal to have the FCI universities provide the science input for a state-wide Florida Climate Assessment, following the example of California and others.

Mitchum also continues a project funded by NOAA in which he is working with partners around the country to develop forecasts of nuisance flooding frequencies. Saint Petersburg was chosen as one of the testbeds for the application of this research and Gary is working with the mayor and his staff to translate this research to useful products for the city.

As described in the Research Highlights section, Dr. Mitchum’s paper in the *Proceedings of the National Academy of Sciences*, is the first to detect sea level rise acceleration in the satellite sea level observations. In addition, the magnitude of the observed acceleration agrees with the prediction of the climate models. This is a game-changing result that removes a major objection of the “climate-change unconvinced’ who say that we cannot see climate change in the data.

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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; Paleoceanography; Paleoecology)

With retirement planned for the end of the 2019 academic year, Dr. Pamela Hallock Muller focused on mentoring five graduate students through to graduation and supporting publication of their research. In 2018, her graduates were Christian Haller PhD, Makenna Martin MS, and Elizabeth Brown PhD, Ben Ross PhD, and Christian Gfatter MS in 2018, she co-authored six refereed-journal publications, four with current or former graduate students, as well as one book chapter first-authored by a former graduate student. She is co-author of an additional six manuscripts, four with current or former students, including one already published in 2019, one in press for April 2019, and one accepted, and three that are in review or revision. In addition, Hallock Muller served as Editor of the *Journal of Foraminiferal Research*, a quarterly society journal that deals with the most abundant shelled organisms in the world's oceans and that have the most detailed fossil record of any group of organisms. She received three honors this year: a) her 1986 paper in *Palaeos* was recognized as one of ten "Landmark Papers in Carbonate Sedimentology and Stratigraphy" by the American Association of Petroleum Geologists' 100th Anniversary Committee; b) she received the 2018 Kosove Foundation USF Distinguished Graduate Teaching and Service Award; and c) the Society for Sedimentary Geology (SEPM) announced that she has been chosen to receive the 2019 Raymond C. Moore Medal for Excellence in Paleontological Research.

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

Dr. Frank Muller-Karger's group published 25 peer-reviewed manuscripts in 2018. Three papers focused on the importance of capacity building in developed nations and among policy makers to better link ocean observing and solutions to socio-economic needs. Three other papers highlighted the definition and requirements for biological and ecological "essential variables", to focus operational collection of information on marine ecosystems as part of international and national observing systems. One paper defined the requirements for a new generation of satellite sensors for Earth Observations focused on coastal zones, estuaries and wetlands. Four papers were published demonstrating the scientific application of processing massive amounts of commercial satellite data, specifically for wetlands assessments. The number of people employed and supported in Muller-Karger's lab through grants and contracts included 13 people (including myself): 5 students (5 PhD), 6 postdocs, and an outreach coordinator. His lab hosted three international scholars, two of them for 2 years each in our lab. Muller-Karger was asked to serve in the Program Committee for the OceanObs19 conference that is hosted once every 10 years, and also to serve in the Integrated Marine Biosphere Research (IMBeR) Science Steering Committee.

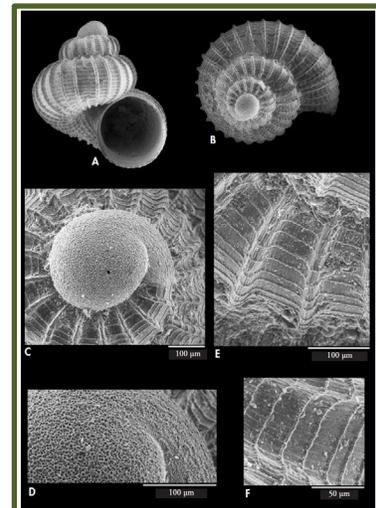
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DR. STEVE MURAWSKI (Population dynamics of exploited marine species; impacts of fishing and other anthropogenic stresses on marine ecosystems; ecosystem modeling and analysis /St. Petersburg Downtown Partnership Peter R. Betzer Endowed Chair)

The Murawski Laboratories consists of elements of the C-IMAGE consortium and the C-SCAMP mapping projects. The major research deliverable produced was a two-volume book series (to be published in 2019) consisting of 63 chapters with over 115 authors for each volume. These books deal with deep oil spills from documented impacts of previous spills and consider factors in responding to future deep spills. Murawski was the first editor and authored or co-authored 13 chapters, among the two volumes. In addition to the books, Murawski co-edited a Special Issue of the *Marine Technology Journal* consisting of papers from the 2018 MTS-GoMRI TechSurge meeting focusing on technological developments post-*Deepwater Horizon*. Field activities consisted of nine research expeditions to map habitats on the West Florida Shelf, and participate in the “Great Red Snapper Count” in the Gulf. Additionally, the C-IMAGE project conducted a highly successful pelagic predator survey aimed at understanding vertical connectivity in the deep Gulf. Murawski also continued his fruitful collaborations with Cuban and Mexican scientists, participating with his students in the 2018 MarCuba meeting in Havana, and planning for another research vessel expedition to Cuba in 2019. To honor the collaborations, Cuban scientists named a new species of gastropod for Murawski from samples collected by the R/V *Weatherbird II*. Murawski was also a motivating force in garnering \$2.4 million needed to renovate of the MSL Marine Environmental Chemistry suite, including \$400,000 of new instrumentation.



USF President Judy Genshaft, USF Sponsored Research Director Paul Sandberg and CMS Dean Jackie Dixon confer at the dedication of the newly renovated Marine Environmental Chemistry Laboratory in the MSL building.



Photomicrographs of a new species of gastropod (Brookula murawskii) named for expedition leader Steve Murawski by Cuban researchers: FERNÁNDEZ-GARCÉS, R., F. RUBIO & E. ROLÁN 2018. A new species of the genus Brookula (Gastropoda, Seguenzioidea) from deep water of Cuba. Iberus, 36 (1): 55-59

FACULTY HIGHLIGHTS

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 co-published a paper in *Geomorphology* investigating underwater terraces surrounding the Maldivian Islands in the Indian Ocean. These terraces, formed during ice ages when sea-level was lower, were compared to a global data set of similar features. The investigation used a portable USF high-resolution multibeam echo sounder and SCUBA dive observations.

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

In 2018 Dr. Ernst Peebles continued serving as Principal Investigator on a research grant that has established USF as a Florida RESTORE Act Center of Excellence (FLRACE). During summer 2018, this ongoing research program underwent its first review by an external panel of internationally recognized experts. After considering the panel's report, the FLRACE Program extended Peebles' funding through 2021, allowing the execution of the first comprehensive survey of drifting fish eggs on the west coast of Florida. This egg survey is scheduled to be repeated on an annual basis until at least 2033, generating fundamentally important information on linkages among fish stocks in different parts of the Gulf of Mexico. The annual egg surveys will make intensive use of DNA barcoding, an approach that is being enhanced and perfected by Dr. Mya Breitbart's lab at USF. The USF Center of Excellence team, which also includes Drs. Steve Murawski and Chris Stallings, intends to build on this funding to create a larger research effort for understanding fish-stock connectedness in the Gulf of Mexico. Early progress on this effort was recently published in *Marine and Coastal Fisheries*. Also as part of this larger effort, Peebles' lab continued developing forensic methods that allow re-creation of the lifetime habitat and feeding histories of individual fish. Information about the Florida RESTORE Act Centers of Excellence Program, administered by the Florida Institute of Oceanography, can be found here: <https://www.facebook.com/floridainstituteofoceanography/posts/880959472015865:0>.

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

At the end of 2018, in the wee hours of December 31, Dr. Rosenheim and colleagues successfully recovered the first sediment samples from Subglacial Lake Mercer – a lake underneath 1 km of Antarctic ice that had never been accessed by humans. At the very end of 2018, a project that had been in the planning stages for many years was finally happening. One week prior to this point, problems with the hot water drill threatened any access to the lake at all. One week after this point, the team would be ready to test CMS's ultimate contribution to this project – the Borehole Gravity Corer. But that is a story for next year's annual review.

There were other successes in 2018. Rosenheim helped plan a new laboratory facility in CMS that will serve the college for many years and will hopefully become as innovative as the space itself. He was able to teach, amidst the planning for the Antarctic expedition and the construction of the laboratory, for an ill colleague in the middle of the Fall semester. Despite the balance of his work effort leaning towards active research and teaching duties, Rosenheim had an NSF proposal recommended for

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funding in December that will take his group to study carbon cycling in the Guianas mud bank coast of northeast South America. All of this activity was showcased locally, nationally, and internationally, from the St. Petersburg Science Fest and the Boyd Hill Nature Preserve all the way to a cover story about his Antarctic expedition in *Nature*.



Brad Rosenheim (USF-CMS) on expedition in Antarctica for the Subglacial Antarctic Lakes Scientific Access (SALSA) project.

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 work on the biological effects of ocean deoxygenation has been highlighted in two important papers in *Science* and *Science Advances*. This work suggests that current oxygen levels are the critical limit for most marine animals and that even very small climate-induced changes in oxygen will result in impaired performance, growth and distribution. Seibel was invited to present a plenary talk on this topic at the International Ocean Deoxygenation conference in Kiel, Germany in September. He is an active member of the Global Ocean Oxygen Network and authored sections of the IUCN report on ocean deoxygenation.

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)

Dr. Amelia Shevenell and her USF CMS PhD student, Imogen Browne, sailed on International Ocean Discovery Program (IODP) Expedition 374 to the Ross Sea, Antarctica (January-June, 2018) as members of the multi-national shipboard scientific party. The two-month expedition aboard the *JOIDES Resolution* recovered marine sediments from close to Antarctica that will help scientists better understand the evolution of Antarctica's ice sheets over the last 20 million years. Drilling on Antarctica's continental margins is technically challenging, but Expedition 374 recovered ~1.8 kilometers of sediment core for future study. Shevenell was part of proponent team of five scientists that conceived of the ~\$12 million drilling expedition during a 2012 Consortium for Ocean Leadership-funded proposal writing workshop that Shevenell hosted at USF CMS. In 2018/2019, IODP will drill three expeditions in Antarctic waters, a first for the program in over a decade. USF CMS students will sail on each of the three Antarctic expeditions. In 2018, Shevenell was awarded ~\$1,200,000 to fund

FACULTY HIGHLIGHTS

her USF CMS Antarctic research program, including funds from NSF and the Royal Society of New Zealand. Also in 2018, Shevenell and her students published eight papers in high-profile scientific journals, including *Nature Geoscience* and *Earth and Planetary Science Letters*. In addition to her research and teaching commitments at USF, Shevenell is a member of the international IODP scientific leadership team and was recently elected as the Geological Oceanographer Councilor to The Oceanography Society's governance council by the international oceanographic community.



Aboard the JOIDES Resolution drillship, Dr. Amelia Shevenell, USF CMS Faculty, examines marine sediments collected by IODP Expedition 374 in the Ross Sea, Antarctica with Co-Chief Scientist, Dr. Rob McKay, of Victoria University, Wellington, New Zealand.



USF CMS PhD student and New Zealand Fulbright Scholar, Imogen Browne, explains how she analyses the physical properties of marine sediments collected during IODP Expedition 374 to the Ross Sea. Ms. Browne will use these sediments to understand how warm ocean waters influenced Antarctica's climate ~16 million years ago.

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

Dr. Chris Stallings published five papers in peer-reviewed journals in 2018, including one led by a graduate student and one by a postdoc in his lab. In 2018, a recent student-led publication (Tzadik et al. 2017, *Limnology and Oceanography Methods*), was recognized by the journal as being one of the two top-most downloaded papers for the year. To celebrate this accomplishment, in association with the journal's ten-year anniversary, we were invited to present the research at a special symposium during the 2019 annual meeting of the American Society of Limnology and Oceanography. The journal has also notified us that the paper is one of the top cited articles in recent publication history. Stallings applied for funding from the National Science Foundation in 2018 to investigate whether Hurricane Michael may have helped to push a highly altered ecosystem in the Florida panhandle from a degraded state back to a high-value one. He was recently notified that the proposal will be funded, allowing him to continue research on the oyster fishery in Apalachicola Bay, an issue that has garnered national attention and is part of ongoing litigation at the Supreme Court of the United States. Graduate students have continued to thrive in the Stallings Lab, with the seventh student graduating in 2018. The student was the second conferred PhD from the Stallings lab, and her time at USF was so remarkable that Provost Wilcox summarized her successes during his commencement speech.

FACULTY HIGHLIGHTS

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

Dr. Robert Weisberg's best work published in 2018 was in collaboration graduate student, Jing Chen and associates Y. Liu and L. Zheng that documented the response of Tampa Bay to Hurricane Irma. This was the first test of a newly formulated, nowcast-forecast numerical circulation model for Tampa Bay and vicinity with resolution as fine as 20 m. The model performed excellently including a demonstration of the Tampa Bay regions that temporarily dried up as Irma drive water out of the bay. This Tampa Bay Coastal Ocean Model (TBCOM) including Tampa Bay, Sarasota Bay, the Intra-Coastal Waterway and all of the inlets connecting these with the Gulf of Mexico is a new, unique tool with daily outputs available to the public at <http://ocgweb.marine.usf.edu/~tbn/index.html>. TBCOM was subsequently used throughout the 2018 red tide event to provide 4.5-day forecasts of red tide movement. Weisberg's work on the 2018 red tide received national as well as local attention in various print, radio and television media.

CMS OCEAN TECHNOLOGY GROUP:

The CMS Ocean Technology (COT) group was involved in a large number of high-profile projects this past year including, but not limited to:

- Contributed to the Spar Buoy project that is described in detail in the Highlighted Research section
- Collaborated with the USGS to incorporate the Carbon Monitoring System on a CMS buoy
- Developed and deployed a Waves Monitoring Station off Pass-A-Grille beach
- Completed a project to develop a Portable pH sensor for use in Citizen Science projects
- Authored multiple papers
- Supported four ocean gliders deployments supporting various funded projects, including the glider deployment described in the Highlighted Research section
- Supported five multibeam and four video mapping cruises

RESEARCH FACULTY ANNUAL UPDATES:

CHAD LEMBKE

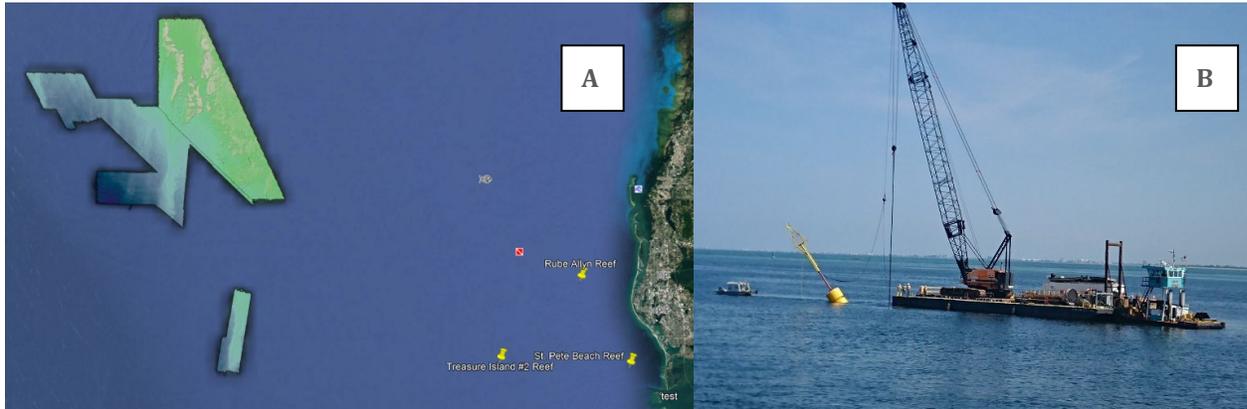
Lembke continued habitat mapping of the West Florida Shelf that allows researchers at USF, state and federal agencies, to understand what the seafloor "neighborhoods" look like. By creating maps similar to satellite maps of land that make it obvious where bears live and people live, bottom habitat maps can provide managers the ability to know where to focus their efforts to ascertain population estimates of fish of economic importance such as Grouper and Snapper. (Figure A) (<https://www.marine.usf.edu/scamp/index.php>).

He also expanded use of the CMS glider fleet, which has resulted in several potential new research pathways. Combining the capability of gliders with other CMS research products (satellites and models) to detect and map Red Tide events has already helped in understanding the evolution of how

FACULTY HIGHLIGHTS

they form and progress. In addition, attempting to find fisheries applications for gliders by incorporating new data sets is allowing for understanding of population patterns and behaviors.

The creation and the deployment of the USF Geodesy buoy in Tampa Bay may provide a groundbreaking method for monitoring seafloor movement to assist in understanding volcanic uplift prior to potential eruptions. (Figure B).



DR. YUN LI

In 2018, Dr. Yun Li established new collaboration with scientists from a number of neighboring research institutions (e.g., MOTE, FGCU, FAU) and out-of-state universities (Wellesley, U. of Alaska, Fairbank). She participated in the development of two new collaborative proposals, and the research teams employed her modeling tools to further the study in the Polar Ocean and the Gulf of Mexico. The proposed research will help her continue the modeling study of environmental science in the next 3-5 years. Li requested \$231K from the *National Science Foundation Polar Program* to investigate biological-physical effects of stratification on Arctic Ocean air-sea CO₂ flux, and \$463K from the *National Oceanic and Atmospheric Administration ECOHAB Program* to develop and implement an individual-based model to help understand mechanisms of *Karenia brevis* bloom initiation on the West Florida Shelf. Li also published one article with the RARGOM working group in *Fisheries Oceanography*. Using Gulf of Maine as a testbed, they synthesized the recent advances in our understanding of ecosystem phenology (Figure). As stated by one of the reviewers “I thank the authors for taking on this very substantial review. I hope that it serves as a model for similar reviews that can be written for other regions”. She is now seeking to develop a similar study for the ecosystem phenology in the Gulf of Mexico.

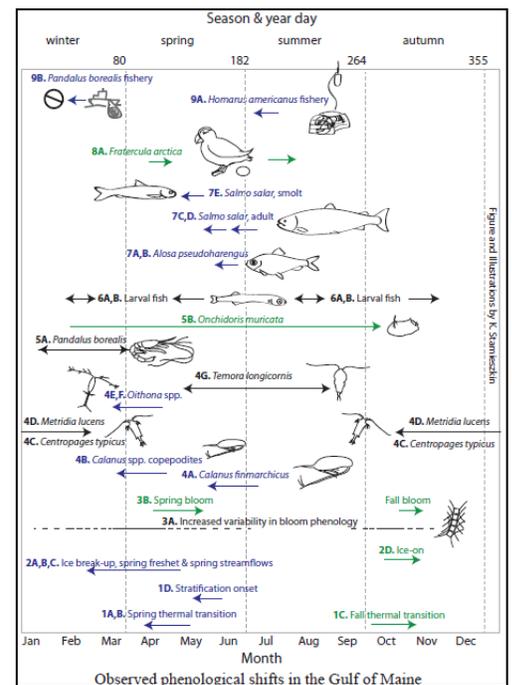
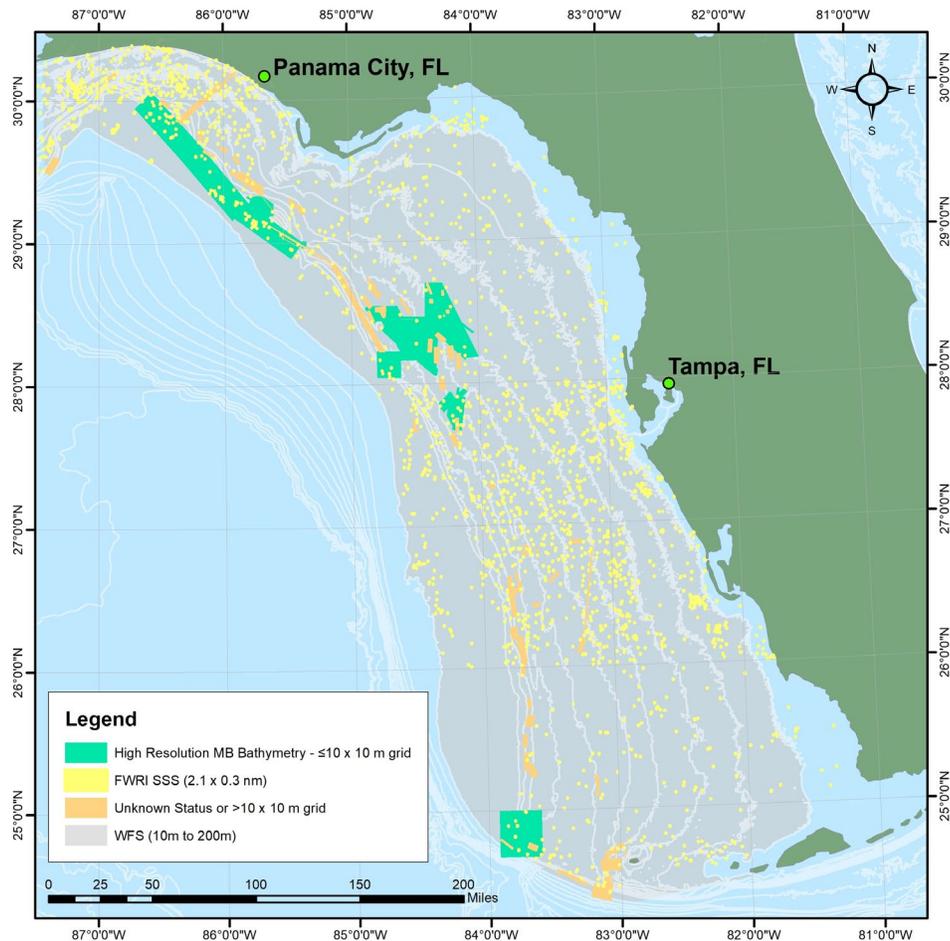


Figure and illustrations by K. Samwelin

FACULTY HIGHLIGHTS

DR. STAN LOCKER

In April 2018 Dr. Stan Locker returned to the faculty at CMS from the USGS where he was a research geologist focused on assessment of coastal evolution and hazards associated with climate change and sea-level rise. Upon returning to CMS, he rejoined the C-SCAMP project and focused on the geologic controls on benthic habitat that are critical factors in marine resource assessments. Two chapters in upcoming Springer book publications were completed - the first presents a global perspective on the geology and geomorphology of mesophotic coral ecosystems (2nd author, due out April 2019), and a second paper summarizes the geologic origin of hydrocarbons in the Gulf of Mexico with a perspective on future exploration trends (1st author, due out June 2019).



Availability of high-resolution multibeam (green), side-scan sonar (yellow; chiefly side-scan sonar) and other mapping data (orange) currently available for the West Florida Shelf. The green areas west of Tampa have all been mapped by USF-CMS researchers during previous and current expeditions. Currently only about 6% of the West Florida Shelf has been mapped.

OTHER EVENTS AND HIGHLIGHTS

Other Events and Highlights

STAFF AWARD:

- **Linda Kelbaugh** received the USF Outstanding Staff Award for 2018 at an awards ceremony on the Tampa campus held on March 29, 2019. Hosted by President Genshaft, the University community came together to recognize and celebrate the 79 honorees.



Provost Ralph Wilcox, Linda Kelbaugh, President Judy Genshaft

2018 EMINENT SCHOLAR LECTURE SERIES:

The USF CMS held its annual Eminent Scholar Lecture Series on April 5-6, 2018 to celebrate “Successful Achievements of Societal Importance in Ocean Sciences.” We featured four guest lecturers:

- **Dan Rudnick** PhD, Scripps Institution of Oceanography, “Observing the Regional Effects of Climate Variability with the California Underwater Glider Network”
- **Ray Hilborn** PhD, University of Washington, “Sustaining Food from the Seas”
- **Maeve Lohan** PhD, University of Southampton, UK, “Zinc and Iron Cycling in Sub-Tropical Atlantic Ocean: Impacts on Biological Processes,” and
- **Kim Cobb** PhD, Georgia Institute of Technology, “Corals and Climate Change – Life and Death on a Remote Pacific Reef”

We held the SciCafé in St. Petersburg at the Dali Museum on April 5, 2018. The topic was “Preparing for Our New Climate: Resist, Mitigate, Adapt.” The panel was moderated by **Rob Lorei**, News Director WMNF 88.5 Community Radio, and the speakers were: **Kim Cobb** PhD, Georgia Institute of Technology and **Sharon Wright**, Sustainability and Resiliency Director, City of St. Petersburg.

ALUMNI SUCCESS:

Dr. Erin M. Symonds: *Costa Rica: Beach water quality and management to protect public health* USF postdoc working with the Instituto de Acueductos y Alcantarillados (AyA)'s National Water Lab in Costa Rica, investigating beach water quality and how it relates to pathogens and human health in Costa Rica

OTHER EVENTS AND HIGHLIGHTS

<https://www.marine.usf.edu/news-and-events/costa-rica-beach-water-quality-and-management-to-protect-public-health/>

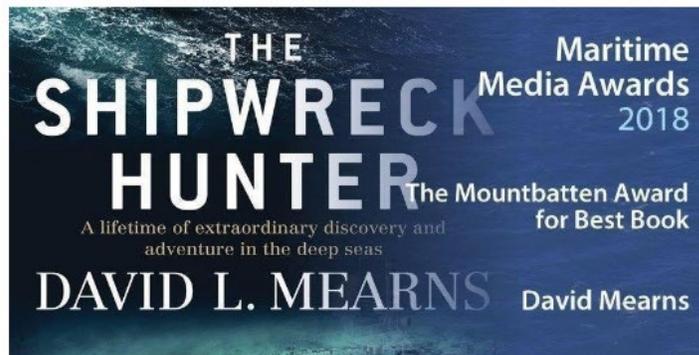
David Mearns: *The Shipwreck Hunter* won the 2018 Mountbatten Maritime Literary Awards in November 2018 in London. It was a unanimous choice by the Judging Panel of the 38 books nominated. *In Search of Emiliano Sala.* A tragic story in the sporting world, USF alumni David Mearns was called in to assist in the search for soccer star Emiliano Sala's plane that went missing last week off the French coast. http://www.espn.com/espn/feature/story/_/id/25876993/in-search-emiliano-sala



David L. Mearns • 1st
Director at Blue Water Recoveries Limited
1w • David L.'s connections

...

My latest book, THE SHIPWRECK HUNTER, won the 2018 Mountbatten Maritime Literary Award last night at Drapers Hall in London. It was the unanimous choice by the Judging Panel of the 38 books nominated.



Dr. Glenn Parsons: Scientist Invents Device to Improve Fishery Operations.

<https://news.olemiss.edu/scientist-invents-device-improve-fishery-operations/>

ALUMNI PUBLICATIONS

Dr. Lee Kump: *Op-ed: Climate Risk Management: A Ways Forward* National Acad. of Engineering *The Bridge* Volume 48 No. 1 - Spring 2018; <https://www.nae.edu/File.aspx?id=181157>

David Mearns: Released his third book in the U.S. *The Shipwreck Hunter: A Lifetime of Extraordinary Discoveries on the Ocean Floor.* Pegasus Books, 2018, 400p. ISBN: 978-1-68177-760-3

Christian Haller: Haller, C., Hallock, P., Hine, A. C., & Smith, C. G. (2018). Benthic foraminifera from the Carnarvon Ramp reveal variability in Leeuwin Current activity (Western Australia) since the Pliocene. *Marine Micropaleontology*, 142, 25-39.

Facilities

Major projects that were completed in 2018 included the remodel of roughly 2700 sq. ft² of lab space (MSL 221F, 223A, B, E, 235A, B) into a state-of-the-art analytical instrument facility and accompanying sample storage and prep space.

This project also involved rectifying some long-standing building code deficiencies: sprinkler coverage was expanded to include the central section of the 2nd floor (~17000 sq. ft²) and the north and south stairwells were enclosed. The center stairwell was removed and its 2nd floor footprint converted into mechanical space for the air handler that services the new lab space. Also in conjunction with the lab remodel/building upgrade project, several additional projects were undertaken in the 2nd floor hallway space: insulation was replaced and upgraded on the chilled water piping; several leaks in the hot water piping were repaired; three old fan coil units that service student office space were replaced; and new acoustic ceiling and LED lighting was installed.

Numerous minor projects were also completed throughout the year including installation of nine additional security cameras (Phase 2 of a multi-year plan); plumbing repairs of multiple toilets in KRC; mechanical repairs to MSL 149A cooler; installation of a dishwasher in the MSAC lounge; flooring repairs in KRC 1120, MSL 154A and 173; new circuitry in MSL 212, 214, and 225B; and painting of various offices.



Doctoral Candidate Susan Snyder at the Marine Environmental Chemistry Laboratory (MECL) Opening.

EDUCATION AND OUTREACH

Education and Outreach

CMS EDUCATION AND OUTREACH PROGRAMS

Teresa Greely and Angela Lodge 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.

The Spoonbill Ocean Sciences Bowl. E&O team hosted the 14th annual academic brain bowl with over 160 participants, including 110 high school students and teachers from across West Florida. Volunteers, both returning and new, represented the FWCC, Eckerd College, USGS, New College, FMSEA, Ocean Optics, USFSP, and USF Marine Science. Congratulations to Eastside High School from Gainesville, Florida who advanced to the NOSB Finals. The Eastside Team placed in the top 10 at the National competition.

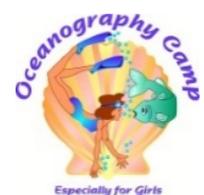


Eastside High School from Gainesville, Florida



Volunteers - FWCC, USGS, NOAA, Eckerd, USF

The Oceanography Camp for Girls. 2018 was the **27th year for the OCG**. Our pre-college STEM program continues to encourage teens to consider careers in the sciences while developing a positive sense of self, science, and the environment. More than **1000 teenaged girls have completed the 3-week program, with 30 girls participating this past summer**. Graduate and undergraduate students served as science mentors with professional staff, and participating scientists from FWCC, USGS and USF Marine Science.



Research Cruise Measuring Fishes



Caladesi Island Coastal Geology – Substructure

EDUCATION AND OUTREACH

As NOAA Ocean Explorer facilitators, the E&O team led a series of **Teacher Professional Development opportunities**. Florida teachers learned ‘*How We Explore, and Why We Explore the Oceans*’ through support by the NOAA Office of Ocean Exploration and Research. 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 48 educators completed the *Exploring the Deep Ocean with NOAA* 7-hour professional development.



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

“Excellent, very informative... Thank YOU!”

“Live stream with Okeanos was wonderful!”

As Florida GLOBE US Partners & Facilitators, the E&O team continued to lead **GLOBE Environmental Monitoring (Citizen Scientist) Teacher Professional Development Program**. Two new partnerships were launched with Florida League of Environmental Educators and the NASA KSC MEI summer programs. Through the **NASA MEI** collaboration 96 pre-service and alternative route STEM educators from Minority Serving Institutions were prepared to lead their future students to be citizen environmental scientists. Teachers learned how to collect and analyze hydrologic, atmospheric, and soil measurements following scientific protocols and sharing internationally. C-MAGE funding helped to support these teacher professional development opportunities.



96 NASA MEI Pre-service Teachers completed GLOBE protocols at NASA Kennedy Space Center

Other Education programs included:

- Taught marine sciences courses for the USFSP Honors College and USF Tampa
- Hosted 5 school groups for summer Precollege STEM programs, lab tours and career explorations
- Over 350 college and K-12 students engaged in coastal field trips at Clam Bayou Marine Education Center
- Served on National Sea Grant site review committee for Puerto Rico program
- 25 community education events at the Clam Bayou Marine Education Center

C-IMAGE CONSORTIUM OUTREACH



The Center for Integrated Modeling and Analysis of Gulf Ecosystems (C-IMAGE Consortium) is an international research group studying the lasting impacts of the *Deepwater Horizon* and *Ixtoc 1* spills - the two largest spills in Gulf history. C-IMAGE shares findings with international partners to provide a better understanding of the processes and impacts of oil spills.

EDUCATION AND OUTREACH

The goal of our outreach program is to provide a humanizing aspect to our science through audio podcasts, public events, and interactive websites.

MARCUBA CONFERENCE

MarCuba Conference Welcomes International Collaboration In October of 2018, CMS researchers and graduate students traveled to the annual conference MarCuba to present their internationally relevant research on the health of the Gulf of Mexico. The conference, in Havana, Cuba, highlighted marine research related to ongoing collaborations between Universities around the Gulf of Mexico and examined the present state of Cuban waters and preparations for the future. Presentations covered the topics of establishing sedimentary baselines, sustainable fishing practices, toxicity in bottom-dwelling fishes, and tracing contaminate trends in northwest Cuba.



C-IMAGE researchers and Dr. Rita Colwell (fourth from right) attending the MarCuba Conference in October 2018 (Sherryl Gilbert, Madison Schwaab, Greta Helmueller, Steven Murawski, Rita Colwell, Makenzie Burrows, Erin Pulster, Brigid Carr)

THE SCIENCE OF FOOD SECURITY

The House Earth and Space Science Caucus (chaired by Representatives Ryan Costello (PA-6) and Jared Polis (CO-2)), supported by the Earth and Space Science Caucus Alliance, presented the second annual Congressional Earth and Space Science Caucus exhibition on “The Science Of Food Security.”

Representatives from USF-CMS, invited by the Consortium for Ocean Leadership, displayed research related to Gulf fishery health, and provided congressional staff and guests with hands-on activities, slideshows and virtual reality experiences on how this research is done.

EDUCATION AND OUTREACH



COL and USF-CMS hosted booth at the Earth and Space Caucus Alliance (Isabel Romero, Sherryl Gilbert)

SCIENCE FESTIVAL, SCIENCE IN THE SUN

Each October since 2012, C-IMAGE joins the St. Petersburg Science Festival to welcome children and families from across the Tampa Bay region to learn about the science happening in their community.

C-IMAGE's lead PI, Steve Murawski, organized Murawski's Minions to share oil spill research through creating 'sediment core from the ocean floor' necklaces, otolith slides, 3D-printed foraminifera, and origami fortune tellers. This year's festival also featured clips from the Dispatches from the Gulf films and a Q&A session with videographer Bill Mills and PhD student Susan Snyder. The C-IMAGE group again partnered with the C-SCAMP Project to offer 3D goggle experience at identifying fishes in protected areas in the Gulf.



Students Madison Schwaab, Bryan O'Malley and Brigid Carr engage with children at Science Festival.

Communications

STRATEGIC COMMUNICATIONS UPDATE – NEW FOR 2018!

In Summer 2018 we hired a strategic communications consultant, Kristen Kusek, to perform a SWOT analysis of the College’s communications strengths, opportunities, and areas for growth. Kusek graduated from the College 20 years ago. She holds dual master’s degrees in marine science and journalism / mass communications and has a wealth of experience in science communications, public outreach/engagement, and development. Since the consultancy we hired Kusek to join our small communications team as a strategic communications director. Strategic communications, marketing, and outreach is an exciting area of growth for the College of Marine Science, especially at a time when the St. Petersburg Downtown Partnership, which has played such a significant role in the history of the CMS, has prioritized marine science storytelling under its new CEO (see <https://stpetecatalyst.com/st-pete-downtown-partnership-ceo-sees-new-chapter-ahead/>).

Key improvements in our communications work include:

- Launched new website in summer 2018, and show continued growth in design, engagement and navigation
- Improved proactive story content generation showing steady engagement growth over time across all social media and web metrics
- Operationalized our communications function, and implemented data-driven procedures as well as QC protocols
- Began more robust media tracking and media outreach
- Laid groundwork to expand storytelling capacity by spearheading marine science journalism internship program with the journalism program on USFSP’s campus next door
- Laid groundwork to play a lead role in St. Petersburg’s new “smart city” initiative



Graph showing increase d engagement on Facebook throughout 2018.

THE COLLEGE OF MARINE SCIENCE: IN THE NEWS

The following list shows select media highlights from 2018. A researcher from the USF College of Marine Science is quoted in each story.

As indicated by a quick scan of this headline list, the epic red tide of 2018 kept the College of Marine Science busy. We have a long history of working in partnership with our neighbor, the Florida Fish and Wildlife Conservation Commission's Florida Wildlife Research Institute (FWRI) to carry out red tide monitoring and response for Florida's west coast. Not surprisingly we saw tremendous engagement on our social networks in response to our regular postings about the red tide throughout the year. Below is one example.

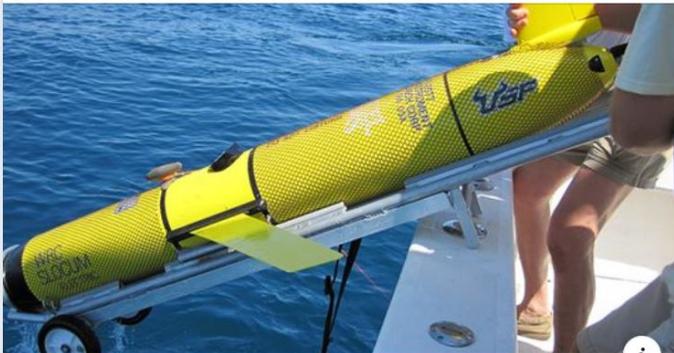
Post Details
✕

University of South Florida College of Marine Science

Published by Jay Novitzke [?] · September 4, 2018 · 🌐

"#Redtide species are always present at low concentration in Gulf waters and we do know what conditions are conducive to development of these devastating blooms," said Jacqueline Dixon, Dean of USF College of #MarineScience

<https://bit.ly/2wH6mvu>



MARINE.USF.EDU

USF Marine Scientists Deploy Robotic Glider to Investigate Source of Red Tide - USF College of Marine Science

✔ **Get More Likes, Comments and Shares**
Boost this post for \$5 to reach up to 2,300 people.

👤 **10,167 people** reached Boost Post

👍❤️ Vivienne Browne, Amy Chatman Crawford and 18 others 19 Shares

👍 Like
💬 Comment
➦ Share
👇

Performance for Your Post

10,167 People Reached

172 Reactions, Comments & Shares 📊

149 Like	20 On Post	129 On Shares
3 Love	1 On Post	2 On Shares
1 Wow	0 On Post	1 On Shares
0 Comments	0 On Post	0 On Shares
19 Shares	19 On Post	0 On Shares

213 Post Clicks

0 Photo Views	67 Link Clicks 📊	146 Other Clicks 📊
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NEGATIVE FEEDBACK

0 Hide Post **0** Hide All Posts

0 Report as Spam **0** Unlike Page

Reported stats may be delayed from what appears on posts

January 10, 2018, **USF College of Marine Science Geologists Join International Antarctic Expedition;**
<https://flrnet.org/usf-college-of-marine-science-geologists-join-international-antarctic-expedition/>

February 12, 2018, **New Satellite Data Confirm Accelerated Sea Level Rise;**
<http://news.usf.edu/article/templates/?a=8266&z=232>

February 12, 2018, **Sea level rise accelerating: acceleration in 25-year satellite sea level record;**

<https://www.sciencedaily.com/releases/2018/02/180212150739.htm>

February 12, 2018, **Research team detects an acceleration in the 25-year satellite sea level record;**

<https://phys.org/news/2018-02-team-year-satellite-sea.html>

March 15, 2018, **Rising Sea Levels Raise New Climate Change Conversations;**

<https://wusfnews.wusf.usf.edu/post/rising-sea-levels-raise-new-climate-change-conversations>

April 16, 2018, **USF students gain valuable experience on floating lab;**

<http://www.fox13news.com/news/local-news/usf-students-gain-valuable-experience-on-floating-lab>

May 16, 2018, **U.S. And Cuban Scientists Join Forces To Protect Shared Marine Ecosystem;**

<https://www.wbur.org/hereandnow/2018/05/16/us-cuba-scientists-marine-ecosystem>

June 27, 2018, **New results of Deepwater Horizon research to protect marine life against future oil spills;** <https://www.sciencedaily.com/releases/2018/06/180627160325.htm>

June 28, 2018, **Massive Fishing Expedition in Gulf of Mexico Establishes Post-Deepwater Spill**

Baseline; <https://www.laboratoryequipment.com/news/2018/06/massive-fishing-expedition-gulf-mexico-establishes-post-deepwater-spill-baseline>

July 6, 2018, **Map Of Gulf Of Mexico Fisheries Prepares For Future Disasters;**

<https://wusfnews.wusf.usf.edu/post/map-gulf-mexico-fisheries-prepares-future-disasters>

July 6, 2018, **USF-led study discovers what lives in the gulf after BP disaster;**

https://www.tampabay.com/news/environment/wildlife/USF-led-study-discovers-what-lives-in-the-gulf-after-BP-disaster_169758716

July 9, 2018, **Column: Don't hurt fisheries with dangerous legislation;**

https://www.tampabay.com/opinion/columns/Column-Don-t-hurt-fisheries-with-dangerous-legislation_169851610

July 9, 2018, **Study examines what lives in the Gulf of Mexico after BP disaster;**

<https://phys.org/news/2018-07-gulf-mexico-bp-disaster.html>

July 13, 2018, **Peter Betzer, St. Petersburg Downtown Partnership;**

<https://stpetersburggroup.com/podcast-episodes/peter-betzer-st-pete-downtown-partnership/>

July 19, 2018, **Red tide comes from ocean, not lake releases;** <https://lakeokeechobeenews.com/lake-okeechobee/red-tide-comes-from-ocean-not-lake-releases/>

July 24, 2018, **Florida researchers team to map entire Florida coast, wildlife habitats;**

<https://www.baynews9.com/fl/tampa/news/2018/07/24/florida-researchers-to-map-florida-coast>

July 27, 2018, **USF Marine Scientists Helping Lead Red Tide Monitoring and Mitigation Efforts;**

<http://news.usf.edu/article/templates/?a=8524&z=232>

August 3, 2018, **Pinellas County braces for red tide;** <http://www.fox13news.com/news/local-news/pinellas-county-braces-for-red-tide>

August 6, 2018, **Red tide increasing in Florida;** <https://www.whsv.com/content/news/Red-tide-increasing-in-Florida-490144101.html>

August 7, 2018, **Toxic algae bloom killing marine life, making people sick along Florida's Gulf Coast;** <https://www.foxnews.com/science/toxic-algae-bloom-killing-marine-life-making-people-sick-along-floridas-gulf-coast>

August 7, 2018, **A look back at the Red Tide outbreak in 2005;** <https://www.tampabay.com/photos/2018/08/07/a-look-back-at-the-red-tide-outbreak-in-2005/>

August 12, 2018, **Crab die-off in Hillsborough Bay could be Red Tide — or something else;** https://www.tampabay.com/news/environment/Crab-die-off-in-Hillsborough-Bay-could-be-Red-Tide-or-something-else_170835274

August 13, 2018, **Gov. Scott declares state of emergency for red tide crisis,** <http://www.fox13news.com/news/florida-news/gov-scott-declares-state-of-emergency-for-red-tide-crisis>

August 19, 2018, **Tracking Florida's Red Tides with Satellites and Smartphones;** <http://www.weathernationtv.com/news/tracking-floridas-red-tides-with-satellites-and-smartphones/>

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August 28, 2018, **USF Marine Scientists Deploy Robotic Glider to Investigate Source of Red Tide;** <http://news.usf.edu/article/templates/?a=8549&z=220>

September 2018, **USF Receives NSF Grant for Florida and Gulf Coast Flood Mapping;** <https://floridaclimateinstitute.org/resources/news-archive/2748-usf-receives-nsf-grant-for-florida-and-gulf-coast-flood-mapping>

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September 10, 2018, **Member Highlight: As Nelson Touts Red Tide Research At Mote, Another Potential Bloom Is Detected;** <https://oceanleadership.org/member-highlight-as-nelson-touts-red-tide-research-at-mote-another-potential-bloom-is-detected/> October 2, 2018, **Satellite images show current size, location of red tide bloom;** <https://www.baynews9.com/fl/tampa/news/2018/10/02/satellite-images-size-location-red-tide-bloom>

October 3, 2018, **Dispatches E-News: Keys to the Past, Drifters & Oil Degradation in Beach Sands;** <https://dispatchesfromthegulf.com/dispatches-e-news-100318/>

October 8, 2018, **Autonomous vehicle takes water samples, helps USF team research red tide;**
<https://www.wfla.com/news/pinellas-county/autonomous-vehicle-takes-water-samples-helps-usf-team-research-red-tide/1508838682>

October 8, 2018, **Red tide report spells good news for Rick Scott;**
<http://floridapolitics.com/archives/276918-red-tide-report-spells-good-news-for-rick-scott>

October 8, 2018, **USF robot provides valuable insight on red tide; ;**
<http://www.fox13news.com/news/local-news/usf-robot-provides-valuable-insight-on-red-tide>

October 18, 2018, **The St. Petersburg Science Festival is right around the corner...;**
<https://tasteofscience.org/tampa-events/2018/10/18/whats-new-in-st-pete-science>

November 9, 2018, **Florida Red Tide: How SECOORA is Helping;** <https://secoora.org/florida-red-tide-how-secoora-is-helping/>

November 20, 2018, **Patchy red tide comparable to a seasonal bloom, scientist says;**
<https://www.heraldtribune.com/news/20181120/patchy-red-tide-comparable-to-seasonal-bloom-scientist-says>

November 21, 2108, **Red tide's grip on SW Florida broken, scientist says;**
<https://www.theledger.com/news/20181121/red-tides-grip-on-sw-florida-broken-scientist-says>

November 27, 2018, **Eight USF faculty members named new AAAS Fellows;**
https://www.eurekalert.org/pub_releases/2018-11/uosf-euf112718.php

December 3, 2018, **Meet Principal Investigator Brad Rosenheim;** <https://salsa-antarctica.org/2018/12/03/meet-principal-investigator-brad-rosenheim/>

December 5, 2018, **What's under the Antarctic Ice Sheet?** <https://phys.org/news/2018-12-antarctic-ice-sheet.html>

December 12, 2018, **The hunt for life below Antarctic ice;** <https://www.nature.com/articles/d41586-018-07669-3>

December 18, 2018, **Science, innovation create jobs, help shape future of St. Pete;**
<http://www.83degreesmedia.com/features/whats-new-in-science-research-in-Tampa-Bay-121818.aspx>

December 19, 2018, **Lower oxygen levels to impact the oceanic food chain;**
https://www.eurekalert.org/pub_releases/2018-12/uosf-lol121918.php

Retirees

DISTINGUISHED UNIVERSITY EMERITUS PROFESSOR JOHN H. PAUL

USF College of Marine Science, 1982-2018

Hear about his work in this recent podcast: <https://stpetecatalyst.com/podcast-episodes/innovation-in-the-burg-pure-molecular-jason-mathis/>



Dr. John Paul has had a distinguished career as a microbiologist. His research focused on developing biological sensors to detect harmful microbes in the coastal ocean; developing “grouper forensics” to detect authenticity of seafood in restaurants and seafood suppliers; the importance of silent viral infections on life in the seas; and mechanisms of gene transfer in the oceans that involve viruses. He published over 170 scientific papers and mentored 22 MS and PhD students.

The common research theme underlying his work is the measurement of gene expression as a means to understanding microbially-mediated processes in the oceans. This is divided into specific areas of research that include lysogeny, microbial gene transfer by virus-like gene transfer agents (GTAs), phytoplankton carbon fixation, and development of sensors. Lysogeny is the process whereby a virus establishes a stable symbiosis in its host. His group is examining the genomes of temperate marine bacteriophages to understand the control of lysogeny in heterotrophic bacteria and picocyanobacteria in the marine environment. This group has also performed several high impact studies documenting the activity of microbial gene transfer by particulate GTAs in both cultures and natural marine microbial assemblages. His studies in carbon fixation have focused on the control of this process in oceanic river plumes. Such plumes have tremendous CO₂ drawdown, yet also behave as areas of high levels of recycled production.

Dr. Paul’s group is using their experience in measuring mRNA as a surrogate for microbial gene expression in the design of hand-held [and autonomous] sensors (in conjunction with the Center for Ocean Technology) for the detection of noxious microorganisms in coastal environments. This has led to the **USF technology spinoff, PureMolecular LLC**, a company that develops applications of gene detection by RNA amplification using point of care handheld sensors and is the focus of the Innovation Corridor that runs the Johns Hopkins All Children’s Hospital, developing molecular diagnostic kits for rapid pathogen identification in clinical environments.

Academic and Professional Honors:

University of Miami: The University’s Candidate for the International Dissertation Award, Recipient of two Bader Fund Research Grants, an American Cancer Society Institutional Research Grant, and a United Way Health Affairs Task Force Grant (P.I. K. E. Cooksey).

Postdoctoral: National Research Council Postdoctoral Fellow, 1980-1982; Finalist, Biology Division, International Dissertation Award Competition.

Career: American Academy of Microbiology Fellow, 1995-present

P.R. Edwards Award Recipient, SE Branch, American Society for Microbiology, 2002

USF President’s Award for Faculty Excellence, 2003

USF Outstanding Faculty Achievement Award, 2003

USF Innovative Research Award, 2015

Obituary

DR. NORMAN J. BLAKE, PROFESSOR EMERITUS

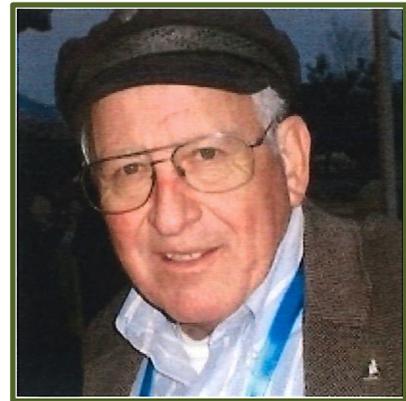
(April 28, 1944 - December 26, 2018)

1972-1977 Assistant Professor, USF Department of Marine Science

1977-1988 Associate Professor, USF Department of Marine Science

1983-2000 Professor, USF Department of Marine Science

2000 – 2007 Professor, USF College of Marine Science



Dr. Norman J. Blake, 74, of Dade City, passed away on December 26th. Norm was born in Haverhill, Massachusetts to Vaughn W. Blake and Beatrice M. Blake. The family moved to St. Petersburg when Norm was 3, and he was a member of the Northeast High School class of 1962. He graduated from Florida Presbyterian (now Eckerd) College, in 1966, where he cultivated many true and abiding friendships. In 1972, he received a PhD from the University of Rhode Island and embarked on a 33-year career on the faculty of the University of South Florida's School of Marine Science. He specialized in shellfish ecology and reproduction, with a focus on the restoration of Florida's native scallop populations. His work will continue into the future through the efforts of the many graduate students he mentored. As a college freshman, Norman met Virginia Dew, of Dade City. They were married after graduation, and enjoyed 52 years together. Virginia survives him, as do their children, Sandra (Larry) Boles, of Newport, Oregon, Dr. Jonathan (Mindy) Blake, of Dade City, and James Blake of St. Petersburg, and grandchildren, Isaac, Tyler, Elijah, Lexi and Levi. Norman was preceded in death by his parents and brothers, Vaughn, Edmond, and Russell. He was the long-time owner of the trawler *Argopecten*, and enjoyed a lifelong interest in the ocean, boating, and marine life. His membership in the National Shellfisheries Association took him to many distant locations, and we know his loss will be felt by colleagues and friends from every corner of the globe. Norm was active in the Pioneer Florida Museum Association (Dade City), having served as its treasurer until very recently. The family is requesting memorial donations to the Museum (www.pioneerfloridamuseum.org) in lieu of flowers. A celebration of Dr. Blake's life is being planned for friends and family in early February.

Appendices

Appendix A

Publications

Appendix B

Active Research Awards

Appendix A. Publications

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

CMS PATENTS (1)

U. S. Patent 10,060,891 B1. Continuous acid-free measurements of total alkalinity. Inventors **Robert H. Byrne** and **Xuewu Liu**, August 28, 2018.

CMS BOOKS (3)

Goodwin, K. D., **F. E. Muller-Karger**, A. Djurhuus, L. Z. Allen, A. E. Allen, J. P. McCrow, and G. C. Hyde. (2018) Chapter 32. Molecular Approaches for an Operational Marine Biodiversity Observation Network. In: *World Seas: An Environmental Evaluation*, Vol. III: *Ecological Issues and Environmental Impacts* 2nd Edition, Charles Sheppard (editor).

Hitchcock, G., S. Chakraborty, and **K. L. Daly** (2018) Biological oceanography of the Gulf of Mexico, In T. S. Bianchi and H. Bustos-Serrano (eds). *Chemical Oceanography of the Gulf of Mexico*, TXAMU Press.

Marengo, J.A., **F. Muller-Karger**, M. Pelling, and **C. J. Reynolds** (2018) The METROPOLE Project – An Integrated Framework to Analyse Local Decision Making and Adaptive Capacity to Large-Scale Environmental Change: Decision Making and Adaptation to Sea Level Rise in Santos, Brazil. In: *Climate Change in Santos Brazil: Projections, Impacts and Adaptation Options*, Editors: Lucí Hidalgo Nunes, Roberto Greco, José A. Marengo, Springer. P. 3-15.

CMS JOURNAL PUBLICATIONS (138)

Ainsworth, C., C. Paris, N. Perlin, L. Dornberger, W. Patterson, E. Chancellor, **S. Murawski, D. Hollander, K. Daly, I. R. Romero**, F. Coleman, and H. Perryman (2018) Impacts of the Deepwater Horizon oil spill evaluated using an end-to-end ecosystem model. *PLoS ONE* 13(1): e0190840, <https://doi.org/10.1371/journal.pone.0190840>.

Androulidakis, Y., V. Kourafalou, T. Ozgokmen, O. Garcia-Pineda, B. Lund, M. Le Henaff, **C. Hu**, B. K. Haus, G. Novelli, C. Guigand, H. Kang, L. Hole, and J. Horstmann (2018) Influence of river-induced fronts on hydrocarbon transport: A multiplatform observational study. *Journal of Geophysical Research: Oceans* 123, <https://doi.org/10.1029/2017JC013514>.

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Barnes, B. B., R. Garcia, **C. Hu**, and Z. Lee (2018) Multi-band spectral matching inversion algorithm to derive water column properties in optically shallow waters: An optimization of parameterization. *Remote Sensing of Environment* 204:424-438 <http://dx.doi.org/10.1016/j.rse.2017.10.013>.

Bart, P. J., M DeCesare, **B. E. Rosenheim**, W. Majewski, and A. McGlennan (2018) A centuries-long delay between a paleo-ice-shelf collapse and grounding-line retreat in the Whales Deep Basin, eastern Ross Sea, Antarctica. *Scientific Reports* v. 8, n. 1, doi:10.1038/s41598-018-29911-8.

Bax, N. J, W. Appletans, R. Brainard, J. E. Duffy, P. Dunstan, Q. Hanich, H. H. Davies, J. Hills, P. Miloslavich, **F. E. Muller-Karger**, S. Simmons, O. Aburto-Oropeza, S. Batten, L. Benedetti-Cecchi, D. Checkley, S. Chiba, A. Fischer, M. Andersen Garcia, J. Gunn, E. Klein, R. M. Kudela, F. Marsac, D. Obura, Y-J Shin, B. Sloyan, T. Tanhua, and J. Wilkin (2018) Linking capacity development to

APPENDIX A. PUBLICATIONS

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- Birk, M., A. E. Dymowska, and **B. A. Seibel** (2018) Do squids breathe through their skin? *J. Exp. Biol.* 221, jeb185553, doi:10.1242/jeb.185553.
- Bonin, J. A.**, **D. P. Chambers**, and M. Cheng (2018) Using satellite laser ranging to measure ice mass change in Greenland and Antarctica. *The Cryosphere* 12, 71-79, <https://doi.org/10.5194/tc-12-71-2018>.
- Booth, H. S., T. J. Pusack, J. W. White, **C. D. Stallings**, and D. L. Kimbro (2018) Experimental evidence that oyster populations persist during predatory snail outbreaks because of intraspecific predator inhibition, not a prey size refuge. *Marine Ecology Progress Series* 602: 155-167.
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APPENDIX A. PUBLICATIONS

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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		Alfred P. Sloan Foundation	4,543	9/15/2013	9/14/2017
Ainsworth		Natl Oceanic & Atmospheric Admin	17,214	9/1/2015	8/31/2017
Ainsworth		University of Miami	2,378	9/1/2015	11/30/2017
Barnes		Kent State University	24,191	5/1/2016	4/30/2019
Barnes		National Aeronautics & Space Admin	78,711	1/1/2017	12/31/2019
Barnes		Environmental Protection Agency	18,446	10/1/2016	9/30/2019
Bonin		National Aeronautics & Space Admin	15,881	5/5/2014	1/31/2018
Bonin		National Aeronautics & Space Admin	80,730	3/1/2017	2/28/2021
Breitbart		National Science Foundation	189,148	12/1/2012	11/30/2018
Breitbart		National Science Foundation	401	12/1/2012	11/30/2018
Breitbart		US Israel Binational Science Foundation	15,989	9/1/2015	8/31/2019
Breitbart		National Science Foundation	60,351	7/1/2016	6/30/2019
Breitbart		National Science Foundation	232,666	9/15/2016	8/31/2020
Buck		National Science Foundation	11,142	3/1/2014	8/31/2017
Buck		National Science Foundation	80,203	7/15/2015	6/30/2019
Buck		National Science Foundation	128,040	2/1/2017	1/31/2020
Buck		National Science Foundation	31,193	3/1/2018	2/28/2022
Buck		University of Fairbanks	1,147	6/14/2018	6/13/2019
Byrne		National Science Foundation	7,055	9/15/2012	3/31/2018
Byrne		National Science Foundation	54,177	8/1/2014	7/31/2018
Byrne		US Geological Survey	3,926	9/1/2014	8/31/2017
Byrne		Texas A&M University	37,475	9/1/2015	8/31/2019
Byrne		National Science Foundation	151,373	2/1/2017	1/31/2020
Byrne		National Science Foundation	133,890	2/1/2017	1/31/2020
Byrne		SRI International	10,900	10/4/2017	3/30/2018
Chambers	Galperin	University of Miami	20,208	7/1/2017	6/30/2020
Chambers	Liang	University of Miami	18,990	7/1/2017	6/30/2020
Chambers		National Aeronautics & Space Admin	7,997	8/6/2012	8/5/2017
Chambers		National Aeronautics & Space Admin	2,970	3/13/2013	3/12/2018
Chambers		NASA Jet Propulsion Laboratory	59,299	6/1/2013	9/30/2018
Chambers		National Aeronautics & Space Admin	175,789	2/16/2016	2/15/2020
Chambers		University of Miami	20,530	7/1/2017	6/30/2020
Chambers		Arizona State University	44,340	8/22/2017	8/21/2020
Chambers		University of Central Florida	16,017	9/1/2017	8/31/2019
Conway		National Science Foundation	30,370	8/15/2017	7/31/2020
Conway		National Science Foundation		9/1/2018	8/31/2021
Daly		University of Georgia	37,005	1/1/2016	12/31/2018
Dixon, T	Lembke	National Science Foundation	48,639	12/1/2015	11/30/2019

APPENDIX B. ACTIVE RESEARCH AWARDS

Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Dixon, J	Naar	US Geological Survey		11/6/2017	4/30/2018
Dixon, J	Naar	US Geological Survey		5/1/2018	2/20/2020
Dixon, J		US Geological Survey	2,029	8/1/2012	7/31/2017
Dixon, J		US Geological Survey	1,254,185	8/1/2017	7/31/2022
Dixon, J		US Geological Survey	7,909	11/6/2017	4/30/2018
Dixon, J		US Geological Survey	4,104	5/1/2018	2/20/2020
Greely		National Marine Sanctuary Foundation	8,331	7/1/2016	8/31/2017
Greely		National Marine Sanctuary Foundation	14,100	5/1/2017	6/30/2018
Hu	Romero	Nova Southeastern University	33,586	1/1/2015	12/31/2018
Hu		National Aeronautics & Space Admin	37,028	8/5/2013	8/4/2017
Hu		National Aeronautics & Space Admin	134,218	7/8/2014	12/31/2018
Hu		National Aeronautics & Space Admin	162,400	1/15/2015	1/14/2019
Hu		National Aeronautics & Space Admin	92,498	10/9/2014	8/31/2019
Hu		Nova Southeastern University	100,824	1/1/2015	12/31/2018
Hu		National Aeronautics & Space Admin	89,399	3/1/2015	2/29/2020
Hu		University of Miami	18,410	10/1/2015	6/30/2019
Hu		University of Miami	38,363	10/1/2015	6/30/2019
Hu		University of Miami	22,094	1/1/2016	12/31/2018
Hu		University of Miami	39,355	1/1/2016	12/31/2018
Hu		National Aeronautics & Space Admin	33,228	9/1/2016	8/31/2018
Hu		National Aeronautics & Space Admin	148,965	1/1/2017	12/31/2019
Hu		National Aeronautics & Space Admin	102,359	2/21/2017	2/20/2021
Hu		Pennsylvania State University	48,663	2/24/2017	2/23/2020
Hu		Observatoire du Milieu Marin Martiniquai	15,823	5/11/2017	9/30/2018
Hu		University of Southern Mississippi	10,332	6/1/2017	5/31/2020
Hu		National Aeronautics & Space Admin	12,610	2/12/2018	10/27/2019
Hu		University of Miami		1/1/2018	12/31/2018
Kilborn		Natl Oceanic & Atmospheric Admin	84,624	9/1/2017	8/31/2020
Lembke		Southeast Coastal Ocean Observing Region	19,543	6/1/2016	5/31/2019
Li		National Science Foundation	63,851	9/1/2017	8/31/2020
Liang	Chambers	National Science Foundation	1,282	9/1/2017	8/31/2020
Liang	Li	Gulf of Mexico Research Initiative	68,193	1/1/2018	12/31/2019
Liang	Liu	Gulf of Mexico Research Initiative	54,099	1/1/2018	12/31/2019
Liang	Weisberg	Gulf of Mexico Research Initiative	10,736	1/1/2018	12/31/2019
Liang		National Science Foundation	71,010	9/1/2017	8/31/2020
Liang		Gulf of Mexico Research Initiative	35,280	1/1/2018	12/31/2019
Liang		National Aeronautics & Space Administration		6/1/2018	5/31/2021
Luther.	Merz	SECOORA		6/1/2016	5/31/2018
Luther		Greater Tampa Marine Advisory Coun.	16	4/9/2004	3/6/2019

APPENDIX B. ACTIVE RESEARCH AWARDS

Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Luther	Merz	Southeast Coastal Ocean Observing Region	60,425	6/1/2016	5/31/2019
Luther		Texas A&M University	37,802	6/1/2016	5/31/2021
Luther		Tampa Bay Estuary Program	13,616	10/1/2017	9/30/2018
Mihelcic	Muller-Karger	National Science Foundation	12,530	10/3/2012	6/30/2019
Mitchum		NASA Jet Propulsion Laboratory	96,361	10/1/2013	6/30/2019
Mitchum		US Geological Survey	48,984	7/15/2012	7/14/2017
Mitchum		US Geological Survey	13,680	9/13/2013	9/14/2018
Mitchum		University of Colorado	6,404	3/14/2013	3/13/2018
Mitchum		US Geological Survey	3,439	8/14/2017	8/13/2022
Mitchum		University of Hawaii	49,330	9/1/2017	8/31/2019
Muller		Florida Fish and Wildlife Conservation	7,605	6/19/2015	6/30/2018
Muller		US Geological Survey	1,368	8/1/2016	7/31/2017
Muller-Karger	Breitbart	National Aeronautics & Space Admin	169,733	8/18/2014	8/17/2019
Muller-Karger		Roffers Ocean Fishing Forecasting Service	74	9/1/2011	8/31/2016
Muller-Karger		National Science Foundation	114,093	9/1/2013	8/31/2018
Muller-Karger		National Science Foundation	401,962	2/1/2014	7/31/2019
Muller-Karger		National Aeronautics & Space Admin	672,072	8/18/2014	8/17/2019
Muller-Karger		National Aeronautics & Space Admin	3,596	8/18/2014	8/17/2019
Muller-Karger		University of Fiji	40,175	4/15/2015	4/14/2018
Muller-Karger		National Aeronautics & Space Admin	36,955	9/1/2015	2/28/2019
Muller-Karger		University of Miami	31,732	9/1/2015	8/31/2018
Muller-Karger		University of Miami	26,918	9/1/2015	8/31/2018
Muller-Karger		National Aeronautics & Space Admin	121,434	5/1/2016	4/30/2019
Muller-Karger		National Aeronautics & Space Admin	27,642	5/1/2016	4/30/2019
Muller-Karger		Texas A&M University	19,000	6/1/2016	5/31/2021
Muller-Karger		North Carolina State University	17,284	8/11/2016	8/10/2018
Muller-Karger		National Science Foundation	7,502	8/15/2017	7/31/2022
Muller-Karger		National Science Foundation	3,067	8/15/2017	7/31/2022
Muller-Karger		Oregon State University	9,523	1/18/2018	1/17/2019
Murawski	Ainsworth	Consortium for Ocean Leadership	109,834	1/1/2015	12/31/2018
Murawski	Ainsworth	Consortium for Ocean Leadership	52,656	1/1/2018	12/31/2019
Murawski	Daly	Consortium for Ocean Leadership	103,310	1/1/2015	12/31/2018
Murawski	Daly	Consortium for Ocean Leadership	19,157	1/1/2018	12/31/2019
Murawski	Greely	Consortium for Ocean Leadership	92,142	1/1/2015	12/31/2018
Murawski	Hollander	Consortium for Ocean Leadership	232,962	1/1/2015	12/31/2018
Murawski	Hu	Consortium for Ocean Leadership	83,848	1/1/2015	12/31/2018
Murawski	Paul	Consortium for Ocean Leadership	53,409	1/1/2015	12/31/2018
Murawski	Peebles	Consortium for Ocean Leadership	9,695	1/1/2015	12/31/2018
Murawski	Peebles	Consortium for Ocean Leadership	10,449	1/1/2018	12/31/2019
Murawski		National Science Foundation	118,858	10/1/2013	9/30/2017
Murawski		Consortium for Ocean Leadership	3,247,588	1/1/2015	12/31/2018

APPENDIX B. ACTIVE RESEARCH AWARDS

Awd PI Name	Name - Co PI If Applicable	Sponsor Name	Total Expenses	Awd Begin Date	Awd End Date
Murawski		Consortium for Ocean Leadership	412,605	1/1/2015	12/31/2018
Murawski		National Fish and Wildlife Foundation	1,030,539	1/1/2015	6/30/2019
Murawski		National Academy of Sciences	234,164	12/1/2016	8/31/2019
Murawski		Consortium for Ocean Leadership	18,524	1/1/2018	12/31/2019
Murawski		Texas A&M Research Foundation	50,000	10/1/2017	7/31/2019
Paul		Natl Oceanic & Atmospheric Admin	97,425	9/1/2015	8/31/2019
Paul		Consortium for Ocean Leadership	8,686	1/1/2018	12/31/2019
Peebles	Breitbart	US Department of Treasury	33,134	9/1/2015	8/31/2019
Peebles	Lembke	US Department of Treasury	149,491	9/1/2015	8/31/2019
Peebles		University of Miami	38,802	10/1/2015	9/30/2018
Peebles		University of Miami	113,088	10/1/2015	9/30/2018
Peebles		US Department of Treasury	(410)	9/1/2015	8/31/2019
Peebles		US Department of Treasury	433,679	9/1/2015	8/31/2019
Romero		University of Southern Mississippi	14,205	1/1/2018	12/31/2019
Rosenheim		National Science Foundation	60,098	7/1/2015	6/30/2018
Rosenheim		National Science Foundation	31,229	6/15/2016	5/31/2019
Rosenheim		National Science Foundation	35,911	9/15/2016	8/31/2019
Rosenheim		National Science Foundation	35,265	3/15/2017	2/29/2020
Seibel		National Science Foundation	4,225	2/8/2016	7/31/2017
Seibel		Natl Oceanic & Atmospheric Admin	207,748	1/1/2017	12/31/2019
Seibel		University of Rhode Island	100,221	12/1/2016	9/30/2019
Shevenell		National Science Foundation	34,872	4/1/2013	1/31/2019
Stallings		FL Department Environmental Protection	18,926	5/30/2014	8/30/2017
Stallings		Florida Fish and Wildlife Conservation	29,599	1/27/2016	7/31/2019
Weisberg	Merz	SECOORA		6/1/2016	5/31/2019
Weisberg	Liu	SECOORA		6/1/2016	5/31/2019
Weisberg	Russell	Pinellas County Florida (Restore Act)	13,320	11/6/2016	12/31/2019
Weisberg	Hu, Lenes, Liu, Walsh, Zheng	Natl Oceanic & Atmospheric Admin	86,554	9/1/2015	8/31/2018
Weisberg	Merz	Southeast Coastal Ocean Observing Region	90,286	6/1/2016	5/31/2019
Weisberg	Liu	Southeast Coastal Ocean Observing Region	246,280	6/1/2016	5/31/2019
Weisberg		Pinellas County Florida (Restore Act)	70,146	11/6/2016	12/31/2019
Weisberg		Pinellas County Florida (Restore Act)	132,286	11/29/2016	8/31/2019
Weisberg		National Academy of Sciences	29,767	4/1/2018	3/31/2019