

OUR LIVING OCEANS

OCEAN HEALTH=HUMAN HEALTH

A Strategic Plan for Harbor Branch Oceanographic Institute at Florida Atlantic University 2018-2022

HARBOR BRANCH

FLORIDA ATLANTIC UNIVERSITY®

INTRODUCTION

Florida Atlantic University's Harbor Branch Oceanographic Institute (HBOI) has been a leader in advancing ocean and coastal science and engineering research at the regional, national and global scale for nearly five decades. From creating novel autonomous sensing systems, designing next generation ocean-observing tools, developing new shellfish and fish species for sustainable aquaculture and food security, searching the deep ocean for cures for disease and monitoring fragile ecosystems like the Indian River Lagoon; HBOI is leading the way in ocean science and technology.

Through the successful implementation of the previous strategic plan, we were successful in elevating our excellence in research and education. To guide us in taking a larger leadership role, we developed a new strategic plan that expounds upon the translational aspect of our science and engineering.

Under this plan, the institute will, more than ever, ensure that our transformative research and innovative technology development result in science-based solutions that improve the quality of life of coastal communities and their economies. It is therefore with great pride that I introduce FAU Harbor Branch Oceanographic Institute's 2018-2022 strategic plan:

Our Living Oceans: Ocean Health = Human Health

As with our previous plan, "Our Living Oceans: Ocean Health = Human Health" is comprised of two sections that are tightly integrated: "Research & Education" and "Stewardship through Partnership". Spread across multiple themes, we have identified several priorities that build on our strengths and address pressing ocean issues.

With the launch of our strategic plan, we are also celebrating the 10-year anniversary of the Institute's union with Florida Atlantic University. As part of the University's Race to Excellence strategic plan, FAU President John Kelly designated HBOI as the headquarters for university-wide research dedicated to ocean and environmental sciences & technology. Faculty members from across the university, as well as external scientific and corporate partners, are part of this new structure that facilitates collaboration and fosters interdisciplinary grant proposals leading to transformational science.

As we embark on our next chapter, I would like to recognize our faculty, staff, students and volunteers for their valuable contributions in expanding and elevating the Institute's impactful research.

Sincerely,

Anton F. Post, Ph.D.

Executive Director

FAU Harbor Branch Oceanographic Institute

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RESEARCH & EDUCATION





The oceans cover more than 70 percent of the earth's surface and provide roughly 50 percent of global oxygen, contain much of the planet's biological diversity and are rich in natural resources that support economies around the globe. It has been estimated that more than 90 percent of the ocean interior and seafloor remain unexplored, underscoring the need for research discoveries and the transformative value they provide. For example, during a 2017 research cruise, HBOI researchers explored pristine coral reefs all along Cuba's coastline, characterizing their diversity and condition.

These studies advance our understanding of the connectivity of Cuban reefs with those in the U.S. and elsewhere in the Caribbean. We continue to discover new coral ecosystems that inhabit the oceans' mesophotic zone (50-150 m depth) and develop technologies that enable their study. Such studies are coordinated via the Cooperative Institute for Ocean Exploration, Research and Technology, a strategic partnership between our institute, partners, and the National Ocean and Atmospheric Administration. From its inception, HBOI has developed novel tools and platforms for ocean exploration that have led to the establishment of several Marine Protected Areas (MPAs) for mesophotic coral reefs off the Florida coast, protection of spawning habitats for commercially and ecologically important species, and discovery of natural products for the treatment of cancer.

The surface ocean (0-200 m depth) has been the main focus of ocean research over the past decades, due to its importance to global carbon and nutrient cycles. Not too long ago, the Census of Marine Life, involving thousands of scientists from 80 nations, concluded a decade of exploration and added more than 6,000 new marine species to the almost 250,000 already known. Whereas discoveries of new species are still regular occurrences, much less is known about the abundance, life histories lifestyles and ecological functions of these organisms. The advances in science and the technology that enabled paradigm shifts in our knowledge of the illuminated upper ocean have opened the doors to a new frontier, the mesopelagic, or the ocean's "twilight zone" (200-1000 m depth) and beyond.

Ocean science at HBOI often explores extreme, hostile environmental conditions that require advanced technologies, which are an ongoing stimulus for innovative research. There is an urgency to increase the pace, scope and efficiency of exploration of the twilight zone due to accelerating human impacts on marine environments. Our institute is at the forefront of exploration and our studies reveal the effects of pollution, overexploitation, acidification, and rising temperatures, which is the first step toward mitigation of such threats.

HBOI RESEARCH PRIORITY:

Mesopelagic Exploration

Building on decades of experience in exploration using innovative technologies, HBOI will become a center of excellence for studies of the ocean's mesopelagic or "twilight" zone (200-1000 m depth).

WE ARE NOW:

- Developing novel sensing technologies and platform capabilities (e.g., underwater vehicles, sampling and observation technology) to sample and study mesopelagic organisms, from microbial and plankton communities, the deep scattering layer, to large nekton including cephalopods, fish, and cetaceans, benthic coral communities, and pollution such as plastics in the mesopelagic
- Exploring and mapping pelagic and benthic ecosystems in the mesopelagic zone
- Defining relationships between epipelagic and mesopelagic systems, such as surface productivity and mediation of particle export to deeper waters, including the benthos, or the role of mesopelagic in sustaining the marine food web
- Studying organism roles in food web structures, transformations of carbon and nutrients as well as their ecology (e.g., bioluminescence, camouflage, migration) and community structure in the global ocean; investigating spawning grounds for critical fisheries and potentially contributing to the fisheries stock assessments in the mesopelagic zone
- Assessing sources of human impact (e.g., plastics, pollutants) on mesopelagic ecosystems and determining their effects on habitat and organisms
- Collaborating with our academic and government colleagues for targeted approaches to exploration and discovery; appropriately documenting, inventorying and disseminating findings to the research community, resource managers, and the public, thereby enhancing our understanding of the interconnectedness of marine resources, ecosystems, and humans to allow for better stewardship of these environments

The coastal ocean provides home and habitat for thousands of organisms, including bacteria, plants, algae, crustaceans, fish, mammals, birds, and most importantly, humans. These organisms are interdependent and connected through complex food webs. Studying these connections and their dynamics over space and time is essential to understanding the vulnerability of coastal ecosystems to human impacts, including the effects of rapidly accelerating climate change and sea level rise.

Approximately, 50 percent of the Earth's human population lives within 15 miles of a coastline, which intimately connects ocean health to human health. Urbanization in coastal regions and an increase in recreational and commercial activities can degrade ecosystems through biological and chemical contamination like nutrient eutrophication, harmful algal blooms and mercury deposition. This can also lead to broader impacts including loss of marine biodiversity, depletion of fish stocks and widespread collapse of coastal and ocean habitats, also referred to as marine "dead zones."

HBOI is located on the Indian River Lagoon (IRL), a biologically diverse, shallow water estuary that spans 156 miles, or 40 percent of Florida's East coast. The IRL generates an estimated \$7.6 billion annual economic impact from recreational, environmental, real estate, restoration and fishing benefits. Urbanization and agriculture have changed the IRL's watershed, resulting in harmful impacts on this fragile ecosystem. For more than four decades, HBOI has surveyed the IRL with a focus on marine mammal and elasmobranch health, nutrient contamination, harmful algal blooms, microbial pathogens, coral reef health, modeling of water circulation, and seagrass health and restoration. In 2013, HBOI initiated the IRL Observatory Network of Environmental Sensors that operates ten environmental monitoring stations comprised of LOBOs (Land and Ocean Biogeochemical Observatories) and weather stations. These stations provide real-time data on water quality and local weather that are publicly accessible via a dedicated website. These data are essential to understanding the causes of harmful algal blooms, the effects of freshwater discharges from Lake Okeechobee on IRL plants and animals and nearby coral reefs, and the impacts of environmental change on marine mammal health and reproduction. While HBOI research has made significant contributions to science, it has also informed policy and management practices, such as septic to sewer conversions, seagrass habitat restoration, *Vibrio* bacteria health cautions, and the linkage of mercury in marine mammals with wild caught fish consumption by humans.

HBOI RESEARCH PRIORITY:

Humans and Environmental Impacts on Florida's Coastal Ocean: Understanding the Processes that Create Threats to Ecosystem Health and Human Health

HBOI will expand its leadership role as the regional center for ocean and human health studies. Through the assessment, integration and translation of marine science research, we will provide tools and data for improved management and conservation of marine ecosystems, thereby enhancing human health at local and ultimately global scales.

WE ARE NOW:

- Conducting innovative research to identify environmental hazards and processes (e.g., habitat degradation, declining water quality, climate change effects, harmful algal blooms and human impacts) that pose critical threats to coastal ecosystems, their plants and animals, and human populations that depend on Florida's coastal environments for quality of life and economic activities
- Providing an understanding of coastal ecosystem functions and services through studies that integrate physical, chemical, and biological processes with system-based modeling efforts
- Using the IRLQ water quality monitoring network in the Indian River Lagoon and St. Lucie Estuary to predict changes in the environment from anthropogenic impacts and to recognize improvements in water quality and the environment when changes such as septic to sewer are in place
- Developing advanced molecular methods to assess and describe specialized metabolites that constitute emerging threats to human and wildlife health
- Studying seagrass, coral reef, and coastal shelf habitats with associated sentinel species (e.g., marine mammals, sharks, turtles, rays) to develop effective conservation and management approaches
- Developing mathematical models to understand and predict how changes in key species or environmental conditions affect ocean and human health
- Combining our expertise in marine ecosystem science, molecular bioscience, and aquaculture techniques to identify and reduce causes of decline and provide solutions for successful restoration of key habitats and organisms (e.g., seagrasses, corals, fish, oysters)
- Partnering with local, state and federal agencies to develop and translate novel solutions for maintaining or restoring ecosystem function in the wake of natural disasters and/or anthropogenic degradation

It is estimated that by 2050 the global population will reach almost 10 billion people, requiring a staggering 70 percent increase in food supply by this date. With dwindling agricultural production, we will be looking at the marine environment to meet these future food demands. Therefore, it is critically important that the combined expertise in marine science, life science, resource management, aquaculture, and innovative technology, together with political and social sciences inform the wise use of marine resources and develop best practices that address the challenges that will come with a growing population.

Wild fisheries stocks are dwindling from overfishing, habitat degradation, shifts in population distributions due to rising sea temperatures, emerging diseases and effects of ocean acidification on reproduction and development. The stress on wild fisheries has created an urgency for advancing sustainably sourced fish and marine products. Aquaculture produces 50 percent of the world's seafood and is expected to increase to 70 percent or greater by 2050. In addition to food production, aquaculture technology supports habitat restoration, supplementation of wild populations (stock enhancement), production of biomass for biofuels, natural products and pharmaceuticals. Sustainable fisheries practices balanced with the cultivation of seafood will contribute to the growing demand for nutritious, high protein food sources.

For over 40 years HBOI has been a leader in advancing aquaculture in Florida, the United States and internationally. In 2012 we developed a novel land-based Integrated Multi-Trophic Aquaculture (IMTA) system that combines the culture of several organisms such as fish, shellfish, and seaweeds to create a balanced ecosystem so that its self-cleaning operation based on recirculation of water leads to zero discharge of waste products into the environment. We further seek to facilitate restocking of depleted fish and shellfish species in Florida coastal waters, Gulf of Mexico and in the wider Caribbean. We use advanced technologies, including marine robots, underwater acoustics, and high performance computing to track changes in vulnerable fisheries populations, to understand the drivers of fisheries decline and recovery and use genomics tools to develop spawning-in-captivity protocols. Research in our Aquaculture Development Park assists in meeting a significant long-term challenge: the expansion of U.S. aquaculture production to grow safe and healthy seafood in a sustainable manner while at the same time reducing the trade deficit and providing jobs and economic growth in coastal and inland communities.

HBOI RESEARCH PRIORITY:

Sustainable Fisheries in a Changing Ocean

We will be world leaders in applied and transformative research on fisheries population dynamics, with the goal of enabling the conservation and restoration of endangered species.

WE ARE NOW:

- Advancing technology used in fishery-independent surveys and habitat-fish assemblages to efficiently study the underlying drivers of fisheries changes
- Developing and implementing methods to restore depleted fisheries stocks through state-of-the-art aquaculture and habitat enhancement as part of a comprehensive ecosystem-based management approach
- Monitoring, assessing, modeling, and predicting impacts of natural conditions and anthropogenically derived stressors on habitat, larval dispersal pathways, migratory patterns, trophic ecology and the associated connectivity shifts that have been driving fisheries to enact change in coastal fishery and habitat management
- Making the recreational and commercial fishing communities and local citizen-scientists integral to our research and education programs
- Providing fisheries and habitat data to be used in state and federal fishery management plans and have HBOI representation on Fishery Management Council Advisory Panels to translate our work into policy

HBOI RESEARCH PRIORITY:

A Multispecies Breeding Facility to Support Marine Aquaculture, Stock Enhancement, and Habitat Restoration

We will be a nationally recognized center for marine and warm water aquaculture that develops methods and systems for mass production of marine products for sustainable food supply, as well as for industrial applications, habitat restoration, and ecosystem-health needs.

WE ARE NOW:

- Developing methods for the reproduction and seedstock production of new species of interest for food, stock enhancement, and habitat restoration
- Designing -omics based strategies for ensuring genetic variability of animals and plants produced in culture that are intended for stock enhancement or habitat restoration
- Establishing nuclear breeding facilities to support selective breeding for improved production of fish, invertebrates, and plant forms (e.g., macroalgae and terrestrial halophytes)
- Implementing solar energy production systems for use in sustainable aquaculture
- Communicating data and findings to appropriate stakeholders for incorporation in production plans, and into stock enhancement, habitat restoration, or other regulatory processes

Critical to the themes of Ocean Exploration, Marine Ecosystem Health, and Wise Use of Marine Resources is the development of next-generation technologies that enable us to observe, quantify, sample, cultivate, and conserve the diversity of marine organisms and habitats. It is the development of innovative technologies that give us access to ocean habitats and discovery of important features. HBOI's legacy of innovative technology that enables cutting-edge science continues to drive our institute today.

Two key innovative technology areas that have been part of HBOI since its inception are our Ocean Engineering and Marine Drug Discovery programs.

Ocean Engineering: HBOI's contributions to the development of sensing, imaging and communication capabilities push the technology envelope and allow us to explore new frontiers in ocean science, in habitats that include the Indian River Lagoon, Florida's coastal waters and the open ocean. From developing an autonomous underwater holographic microscope to advancing acoustic tagging of shark and ray species to locating fisheries spawning grounds to designing the next generation of ocean observing satellite, our researchers are at the forefront of developing new and unique underwater observation platforms, seafloor mapping, undersea networking and advanced sensor packages. Our engineers are working with aquaculture researchers to develop novel tools and sensors that advance the development and commercialization of aquaculture species.

Drug Discovery: The ocean is a seemingly inexhaustible source of natural products that have potential in medical applications. It is the small organic molecules produced by plants, microbes and animals that have been critically important in developing the more than 60 percent of the therapeutics in clinical use. In particular, marine invertebrates and their associated microorganisms are a rich source of natural products that lead to the development of clinically useful agents. We hold a global collection of marine sponges and other invertebrates (>30,000 specimens), their bacteria (>19,000 strains) and the bioactive compounds they produce. By combining our emerging understanding of what drives disease initiation and progression with novel technologies (e.g., biosynthesis, genetic engineering) in marine drug discovery, HBOI forms a gateway for the identification of bioactive compounds that lead to better, more selective therapies for different types of cancer, Alzheimer's disease and antibiotic resistance.

HBOI RESEARCH PRIORITY:

HBOI Research Priority: Autonomous Sensing in the Marine Environment

The institute will expand on its leadership role as a developer of passive and active remote sensing technologies, including both optical, acoustical and electrochemical, as powerful multidisciplinary tools for studying coastal and oceanic environments, from fine scales to synoptic global scales.

WE ARE NOW:

- Advancing remote optical and acoustic sensing technologies and deployment platforms such as AUV and UAV drones to support ocean science and observing and collecting, with a focus on exploration of the ocean's twilight (mesopelagic) zone
- Developing sensors to identify environmental hazards and implementing innovative algorithms to interpret remote sensing data to address threats to coastal ecosystem health and human health from issues such as harmful algal blooms, coral reef impacts, and depleted fisheries and habitat degradation
- Employing advanced computing techniques to optimize information content and transmission of imagery from remote deployment platforms to laboratory settings
- Investigating issues affecting human health, such as seafood safety and biotoxin detection
- Implementing sustainable aquaculture technology such as solar arrays for energy production and new technologies to advance seafood production and restoration
- Developing new data dissemination tools to enable data abstraction and information integration to achieve multi-dimensional, multi-scaled, real-time monitoring of ecosystems

HBOI RESEARCH PRIORITY:

Marine Biotechnology to Address Critical Challenges in Human Health

HBOI will be a world leader in the use of marine drug discovery to provide therapeutic solutions for some of the most challenging diseases that plague mankind.

WE ARE NOW:

- Delivering natural products that address critical challenges in human health such as cancer, neurodegenerative, cardiovascular, metabolic and infectious diseases
- Developing innovative screening platforms to identify compounds for clinical development
- Developing medicinal chemistry expertise and collaborations to optimize drug-like properties of natural products to advance them for clinical development
- Innovating sustainable methods for producing economically viable supplies of compounds for clinical development
- Collaborating broadly with both academic and commercial life science sectors to expand the disease areas in which we can make an impact
- Capitalizing on the rapid expansion of genomics to identify, modify, and express genes responsible for the biosynthesis of natural products to provide sustainable supplies of compounds for clinical use, as well as compounds with enhanced potency and fewer side effects

TRAINING THE NEXT GENERATION OF OCEAN SCIENTISTS AND ENGINEERS

In order to tackle the complex coastal and ocean problems of the 21st century, HBOI expands upon its cutting-edge research by training the next generation of ocean scientists and engineers. Our educational programs require that both teaching and research draw on interdisciplinary approaches to address basic and applied science questions. Across FAU, we partner with colleges and their faculty to deliver highly competitive academic programs in marine science, ocean engineering, aquaculture and drug discovery. The growth of our educational programs will benefit the Institute's goals for research excellence, such as increased grant awards and publications. Our programs form a pipeline that includes:

Semester By The Sea is an undergraduate program that was launched in 2001 and is jointly offered with the Department of Biological Sciences in the Charles E. Schmidt College of Science at FAU. This spring semester-long immersion in marine science for undergraduate students is held on the HBOI campus. Team-taught classes expose approximately 25 students per semester to experts in diverse marine fields. Students have the opportunity to obtain research skills and knowledge that provide a strong foundation for a career in marine biology and for excelling in graduate programs.

The institute's renowned summer intern program, which celebrates more than 40 years of success, awards internships to around 20 top undergraduate and graduate students each summer. The students come from all over the country to participate in a 10-week immersion program that cuts across all aspects of research at our institute. Students refer to this internship as a life-changing experience, as it often impacts their decisions about attending graduate school and leads them to pursue their careers in a marine science or engineering discipline.

Masters and Doctoral Graduate Students. In 2017, FAU established a master's degree in Marine Science and Oceanography as well as a Marine Science and Oceanography track in the Integrative Biology doctoral degree. HBOI and the Charles E. Schmidt College of Science jointly administer these programs. Students have the unprecedented opportunity to work directly with world-class researchers, both at HBOI and throughout FAU, in their labs and in the field. Graduate students gain a broad understanding of coastal, nearshore and oceanographic science, along with the research and inquiry skills necessary to independently conduct research and answer questions within their area of specialization. Students graduating from these programs will be well situated to enter the workforce and to apply their skills to research, management and administrative questions related to coastal and oceanographic issues in higher education, government, private sector and non-profit organizations.

Postdoctoral Investigators have always been an integral part of the fabric of the Institute. They are a source of up-to-date knowledge and skills that make essential contributions to the innovative science and engineering research conducted at HBOI. Postdocs typically spend two years researching with a faculty mentor in one of the many fields of research at the Institute.

HBOI EDUCATION PRIORITY:

Achieve Highly Competitive Graduate and Postdoctoral Programs

Energized by the new graduate programs, we will be a magnet for recruitment and training of the best students and postdocs to educate the next generation of ocean scientists and to advance research excellence across the Institute.

WE ARE NOW:

- Investing in the best and brightest graduate students and postdocs from across the nation by providing competitive fellowships through research grants and dedicated fundraising efforts
- Improving our recruiting efforts through an aggressive marketing approach, including an online advertising network; direct promotion within universities, at conferences, and during recruiting events; and a streamlined application process that will be used to select the best students
- Building a strong pipeline for graduate students that includes recruiting highest performing students from Semester By The Sea, summer intern program, and the Harriet L. Wilkes Honors College

We will be an institute that promotes excellence in teaching and mentoring of our graduate students and postdocs and produces the next generation of researchers that are innovative and transformational in the ocean science and technology fields.

WE ARE NOW:

- Providing dedicated faculty support to develop and teach new course materials and to mentor graduate students
- Investing in student and postdoc mentorship development of the HBOI faculty
- Conducting peer review of HBOI faculty teaching and mentoring activities

We will be a place where students and postdocs enrich their academic experiences in research and education through a unique, on-campus experience and a focus on career development.

WE ARE NOW:

- Expanding our ability to provide student housing via the planning of a Student Village to include dormitories and small apartments, an activity center, cafeteria and a center for student services
- Inspiring undergraduate and graduate students as well as postdoctoral researchers by guiding their development to becoming competitive and successful members of the academic and research communities



STEWARDSHIP THROUGH PARTNERSHIP



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PARTNERING IN INFORMAL EDUCATION AND PUBLIC OUTREACH

From its inception, HBOI has been a resource for Treasure Coast communities and beyond by providing information about the importance of our oceans and the role they play in our daily lives. As a leader in ocean science and technology, HBOI publishes its research findings in professional journals and also through community channels. The sharing of research progress with the public is key to the Institute's goal of advancing the public's ocean literacy and furthering our collective stewardship of the environment. When we communicate the vital role that HBOI plays in fostering healthier ocean, coastal and estuarine environments, we enhance the public's knowledge so that they can support scientific endeavors and ocean conservation.

HBOI's Mission: Ocean Discovery program provides a platform for the public to learn about ocean science and engineering topics and make personal connections with our researchers. Guests explore our Ocean Discovery Visitors Center that has exhibits that represent our research, engage in public lecture series (The John and Barbara Ferrera Ocean Science Lecture Series and the Marine Science Fridays series), and participate in immersion tours of our research facilities. Our outreach activities in the community include science fairs, partnering with community organizations (e.g., Boys and Girls Club of America), and educational booth displays at festivals and other events.

HBOI PRIORITY:

Partnering In Informal Education And Public Outreach

We aspire to be a nexus for ocean literacy where people of all ages learn about ocean health and understand how it equates to all aspects of human health.

WE ARE NOW:

- Attracting a wider audience by increasing the presence and accessibility of HBOI science through public programs that highlight the significant role we play in promoting a healthy ocean environment
- Establishing an exhibit that highlights the HBOI legacy in ocean technology and exploration that includes the Johnson Sea-Link submersible
- Enhancing the exhibits at the Ocean Discovery Visitors Center to showcase our current research efforts
- Strengthening the Ocean Discovery Visitor Center by pursuing museum accreditation with American Alliance of Museums
- Advancing an initiative to house our collections, archives and technology in a new exhibition hall that will grow our outreach and education program for the public and for scholars
- Developing citizen science programs that will engage the community in cutting-edge research with real-world applications that help vulnerable ecosystems of Florida's coastal ocean
- Partnering with organizations and stakeholders to develop on and off-site programs to promote ocean literacy among underserved sections of our communities
- Assembling a team of ambassadors comprised of researchers, educators, graduate students and volunteers that will work together to communicate the research findings of the institute
- Establishing a group of advisors (e.g., Ocean Discovery Circle) that will assist in community engagement and fundraising for outreach efforts and for onsite programs and expansions

CULTIVATING PARTNERSHIPS FOR RESEARCH AND DEVELOPMENT

The success and growth of HBOI's research excellence are driven by strong partnerships and the engagement of a wide variety of stakeholders, which include federal and state agencies, counties and municipalities, local communities, foundations, corporations, economic development councils, research and education organizations, philanthropic donors and volunteers.

By proactively teaming with these groups, we are able to leverage our capabilities and transform our research into new tools and sensors, products, intellectual property and business opportunities. Our ocean science and engineering research contributes to the Blue Economy, where the sustainable use of ocean resources is used for economic growth, improved livelihoods and job creation, and the promotion of ocean health.

HBOI is recognized for successful partnerships with agencies and industry and for translation research results into solutions for challenges facing ocean health and human health. Some accomplishments include:

- 1 Tracing nutrients in the Indian River lagoon, which resulted in findings that are driving septic-to-sewer conversion along Florida's coastline
- 2 Using sensor technologies, such as the HBOI's Land and Ocean Biogeochemical Observatories (LOBOs), to predict causal relationships between water quality and harmful algal blooms or *Vibrio* pathogen emergence
- 3 Analyzing how mercury accumulation in the upper food web impacts human health through consumption of wild caught fish
- 4 Commercializing techniques to culture clam, shrimp and fish and the use of integrated multi-trophic aquaculture to promote clean aquaculture
- 5 Capitalizing on drug discovery from sponges and microbes to help cure diseases such as pancreatic cancer, MRSA, and Alzheimer's

HBOI PRIORITY:

Cultivating Partnerships for Research and Development

HBOI will be a catalyst for science innovation at the interface of natural and built environments, providing the sound science that underpins the formulation of environmental policy and the implementation of management practices that enhance the quality of life within coastal communities including the Indian River Lagoon, Florida's coastal waters and beyond.

WE ARE NOW:

- Advising external partners on opportunities for collaboration and investment that drive a sustainable Blue Economy that aligns ocean health and human health with economic growth of the region; this includes dissemination of ocean science- and technology-based solutions to improve management policies and practices
- Developing a "Tech Runway" incubator for startup business at HBOI in partnership with FAU Tech Runway and the St. Lucie County Economic Development Council; stimulating entrepreneurship and inspiring public-private partnerships that foster sustainable economic growth, revitalization of existing business, and growth of new businesses in disadvantaged communities
- Motivating and expanding stakeholder investment and involvement in HBOI by: maintaining organizational memberships and board seats, attending and hosting meetings that bring together scientists, business and community stakeholders and providing science presentations via our speaker's bureau
- Building a robust portfolio of financial support (e.g., federal, state, foundation, corporation, philanthropic) to benefit the growth of operations, research and education initiatives at the Institute and across the pillar
- Developing institutional proposals that manifest in impactful grants that expand on the HBOI role in community engagement and environmental stewardship
- Broadening relationships through internal and external advisory groups and circles of friends that grow our community of supporters in our region, nationally and globally



ADVANCING RESEARCH EXCELLENCE AT FLORIDA ATLANTIC UNIVERSITY

HBOI is world-renowned for its excellence in ocean science and technology research. In 2007, the Institute became part of Florida Atlantic University, which bolstered both entities in the realms of education and research related to ocean science and technology. Prior to this time, HBOI had already begun educational collaboration with FAU, which in 2001 led to the Semester by the Sea program for FAU undergraduate students. HBOI is a distinctive part of the University, bringing high-quality research that promotes student recruitment and attracts postdoctoral investigators and faculty to the University.

In 2015, FAU launched its Strategic Plan: A Strategic Plan for the Race to Excellence 2015-2025, which outlines primary research pillars and knowledge platforms that guide the university's goals and strategic actions aimed to become a preeminent public university in both research and education. HBOI's innovative research in ocean science and technology led to its designation as the headquarters for the university's pillar focusing on Ocean and Environmental Science & Technology. This charge expands the FAU Harbor Branch brand across the University. In 2017, this Pillar was launched and is actively building collaborative research projects across all campuses and colleges of the University.

HBOI PRIORITY:

Advancing Research Excellence at Florida Atlantic University

HBOI will promote ocean science as a translational science across FAU campuses and colleges and become a role model for science-based solutions that will benefit the quality of life and the economies of coastal communities.

WE ARE NOW:

- Coordinating ocean and environmental science & technology strengths across the University through pillar memberships (e.g., college and unit faculty) and external affiliates (e.g., collaborators as well as stakeholders like organizations, corporations, government and community)
- Hiring joint appointment faculty between pillar and colleges to grow the university research portfolio in ocean and environmental science & technology that promotes preeminent research and elevates the national and international status of the university
- Building University-wide research initiatives to increase annual extramural research funding and expenditures, which includes providing seed grant funding to accelerate ideas into proposal submissions to federal agencies and other sponsors
- Inviting external distinguished researchers to speak and to spark collaborations through the “Science to Solution Seminars – translating science to improve economies and quality of life” series
- Securing fellowships for graduate students, postdoctoral investigators, and interns to conduct cross-disciplinary research with the members of the pillar
- Highlighting and communicating the pillar’s research excellence accomplishments nationally and internationally, which includes announcements of competitive grant success, research highlights, and peer-reviewed publications.

HBOI will continue to be FAU’s differentiator for attracting top faculty, students and postdoctoral investigators to engage in ocean science and engineering research on regional, national and global scales.

WE ARE NOW:

- Growing a robust joint MS degree and Ph.D. track in Marine Science and Oceanography with the Charles E. Schmidt College of Science to attract top-tier graduate students to conduct research with HBOI and college faculty
- Engaging in international relevant research that attracts global communities to FAU and expands the diversity of students at the University
- Working with University leadership to secure resources from various funding sources (e.g., legislative budget requests, capital campaigns, foundations) to keep up with the growing pace of HBOI’s research and academic enterprise (e.g., student village, reconditioning of the waterfront, utility efficiencies, cutting edge research facilities)



EMPOWERING THE HARBOR BRANCH COMMUNITY

HBOI's success builds off the collective contribution by the organization's faculty, staff, students and volunteers. Maintaining our collegial and productive work environment requires that we continually strive to be a workplace that supports and encourages the individual while fostering team-work and promoting the integration of research, education, administration and operations.

Based on 2017 numbers, we have approximately 180 employees and 110 volunteers. Approximately 20 percent of the employees are faculty and project managers, 50 percent are research staff and graduate students, and 30 percent are administrative, research support and campus operational staff. Throughout the year we inform faculty, staff, students and volunteers of the organization's activities, goals, and accomplishments through weekly electronic internal news, All Hands meetings, social media (e.g., website, Facebook and Twitter), email correspondence from HBOI and the University, and other social and recognition events and activities. Administrators, managers, and supervisors are expected to provide training and development opportunities for their employees to meet personal, professional and Institute goals.

As our research and academic programs continue to excel and expand through the implementation of the themes and priorities in this strategic plan, new opportunities will emerge for internal workforce development and promotions and the addition of new hires. The HBOI community is expected to work collaboratively, which will attract new projects and talent along with recognition of the individuals and the Institute.

HBOI PRIORITY:

Empowering the Harbor Branch Community

HBOI will be a preferred workplace where faculty, staff and volunteers are part of an integrated, empowered community that together advances excellence in ocean science and technology.

WE ARE NOW:

- Providing an environment of collaboration, respect and accountability
- Emphasizing the importance of all work performed in support of the research and academic mission
- Encouraging and recognizing excellence
- Providing opportunities for career growth through professional workforce development, internal promotions and/or through cross-training, demonstrating to individuals that they are a valued part of the organization, fostering personnel retention as well as organizational efficacy
- Providing opportunities for training and participation in research, academic and support activities for all Institute roles
- Providing regular and timely communications regarding Institute activities and outcomes
- Encouraging teamwork and positive contribution to the Institute's mission

WISE USE OF HARBOR BRANCH RESOURCES

Located on 144 acres along the Indian River Lagoon in Ft. Pierce, HBOI's campus has many acres of green space, natural beauty and is an aesthetically pleasing place for employees, partners and visitors to enjoy. The campus has a deep-water channel for ships. There are 32 buildings on site that house research laboratories and offices, administration offices, education classrooms and auditorium, engineering research and development facilities, an aquaculture development park, small boat operations center, visitor center, cafeteria, shipping and purchasing and facilities and grounds.

After joining FAU, significant portions of the campus utility and information systems infrastructure were replaced, several buildings were renovated, and a new research building that is now home to roughly half of our marine science and oceanography faculty and students was constructed. As part of FAU's Race for Excellence strategic plan, we will address aspects of our Master Plan to support programmatic and campus needs that emerge from the Institute's 5-year strategic plan.

HBOI PRIORITY:

Wise Use of Harbor Branch Resources

HBOI will be a state-of-the-art campus that promotes economic efficiency and environmental stewardship.

WE ARE NOW:

- Working with FAU offices to identify state and federal funding sources, foundation grant opportunities and philanthropic gifts to support the expansion of research and teaching space, addition of a student village with dormitories, reconditioning of the channel and other infrastructure priorities
- Specifying Master Plan priorities to be included in FAU's annual Capital Improvement Plan (CIP) and working with FAU to strategically utilize private and Public Education Capital Outlay (PECO) dollars according to the following ranking of need:
 - ① Life Safety
 - ② Maintenance and Repairs
 - ③ Lab and Instructional Needs
 - ④ Aesthetic Improvements
- Planning the HBOI channel seawall reconditioning and the dredging of the HBOI channel to accommodate oceanographic research vessels
- Exploring opportunities with local electrical utility providers and private companies to develop solar array demonstration projects at HBOI that will enhance the utility resource efficiency of our campus and lead to sustainable solar generated electricity
- Engaging St. Lucie County utility provider to extend potable water supply infrastructure to the HBOI campus
- Planning for facilities that support research and academics such as a Student Village, Aquaculture Breeding Facility, and Ocean Discovery Visitor Center Exhibition Hall

HARBOR BRANCH

FLORIDA ATLANTIC UNIVERSITY®

Ocean Science for a Better World®

www.fau.edu/hboi

5600 US 1 North, Fort Pierce, FL 34946

772-242-2400

