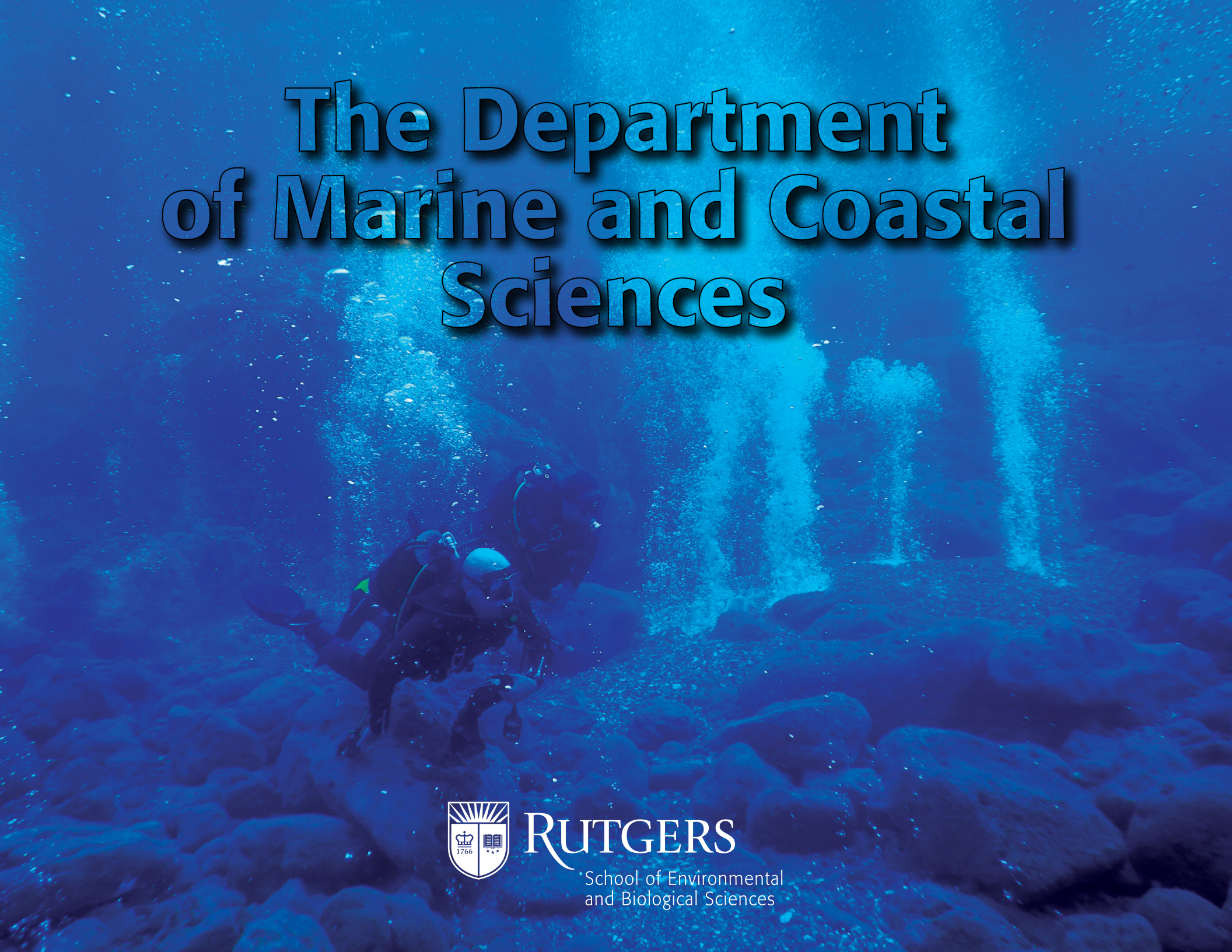
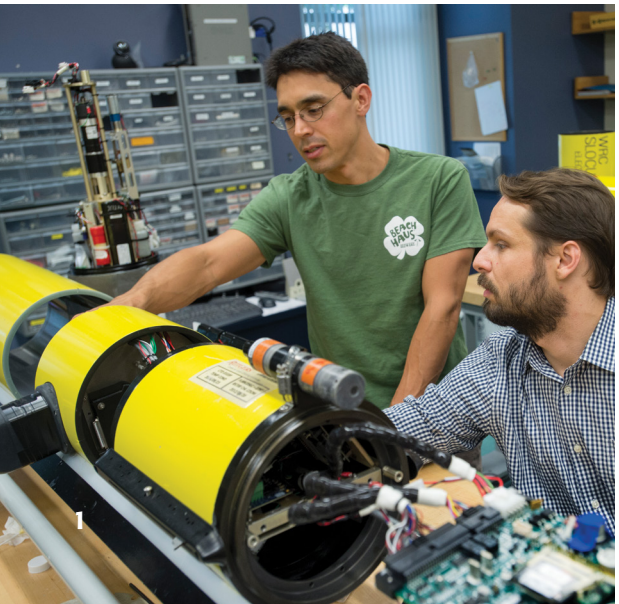


The Department of Marine and Coastal Sciences

RUTGERS
School of Environmental and Biological Sciences



Welcome to the **Department of Marine and Coastal Sciences (DMCS)** at Rutgers University, the State University of New Jersey where we are exploring critical processes on this ocean planet. Faculty and students in DMCS are working all over the world, traveling from the tropical to the polar seas on scientific expeditions. Our undergraduate and graduate students are essential members of our research teams. We work in state-of-the-art laboratories, on vessels, and in classrooms to give students hands-on, experiential learning opportunities.

DMCS undergraduates made history in 2009 by piloting the first autonomous underwater robot across an ocean basin. From 2013 to 2017, our gliders circumnavigated the ocean basin – another first! We invite you to be a vital part of the collaborative group at DMCS, which has been an incubator for modern technology, scientific discovery, and sustainable practices for over a century.

RUTGERS MARINE SCIENCE EDUCATION AT A GLANCE:

- Thomson Reuters ranked Rutgers University in 2011 as #4 in the world for the Top 30 Research Institutions in Oceanography. College Values Online lists the Rutgers bachelor's degree in Marine Science as one of the Top 20 Best Values for a degree in 2020.

- Our faculty and students regularly receive the highest awards and fellowships bestowed upon members of the marine science community. View some of our honors here: *marine.rutgers.edu/category/awards*.

- Rutgers undergrads conduct research with faculty on every continent across the globe. When students piloted the first underwater robot from New Jersey to Spain in 2009, both the White House and the government of Spain recognized this amazing accomplishment. Rutgers gliders circumnavigated the South Atlantic Ocean from South Africa to Brazil and back, and students have collected data on a glider's journey through the Indian Ocean.

- Our research program generates tens of millions of dollars each year, and the knowledge gained from our studies helps grow the state and global economy. Faculty and students investigate water quality in New Jersey and develop methods for keeping local fisheries healthy, while building and improving aquaculture industries.

- Rutgers Marine Science students benefit from a new curriculum that can fast-track professional degrees and certificates. Our graduates move into challenging and diverse jobs in the private and government sectors immediately upon receiving their degree.

Rutgers students participate in a research cruise to collect samples and data for their course work.

OUR ALUMNI TESTIMONIALS

SOPHIA BEREZIN

"One of the great things about the Department of Marine and Coastal Sciences is that everyone is very friendly and eager to share their research, and it is very common for professors and grad students to be in need of an extra set of undergrad hands to help out in the lab. This makes getting relevant research experience a lot easier than in other fields, which ultimately sets you up for a more successful post-grad life. The wide variety of electives provided through the marine science department gives students the chance to explore a huge diversity of different subsets of the field, which exposes us to so many opportunities we may not have even known we wanted. After graduation I started working full time as a lab technician at one of the Rutgers off campus labs.

Another great part of this major and the university is that we offer scuba certifications, either through classes for credit or as separate courses. Without these courses being offered directly at Rutgers, I probably would never have gotten scuba certified, and would be missing out on some very cool experiences. Overall, Rutgers and the Department of Marine and Coastal Sciences have provided a varied, interesting, and hands-on learning experience to countless undergrads, and I highly recommend the marine sciences major to any incoming freshman."

HOSSEIN ZOLFAGHARI

"My experiences with my professors and fellow classmates in the Department of Marine and Coastal Sciences were easily the most exciting and fulfilling opportunities I had during my undergraduate education. Many classes were designed to get students out in the field to learn science by doing science. When I studied abroad in Valencia, Spain during my sophomore year, I used my data analysis experiences from my classes to secure a research position at the University of Valencia. My favorite courses came during my senior year. For one course we met at the Rutgers University Marine Field Station in Tuckerton, NJ, where we waded through salt marshes collecting local fish species, learned various trawl techniques, and studied the key bodily structures of fishes in anatomy lab. In another hand-on course we boarded the Rutgers research vessel and cruised through the Raritan River all the way to New York City, collecting samples and data we would use for the rest of the semester to analyze key oceanographic concepts in our local waterways. My curiosity in both marine science and humans led me to major in marine biology while completing the

pre-medical track, hoping to work as an expedition physician in the future. With the strong scientific background and unique opportunities that I gained through my marine science curriculum at Rutgers University, I was accepted at New Jersey Medical School where I will be starting in August 2023."

EVYATAR "AVI" KANIK

"If you've ever watched Carl Sagan's Cosmos series, you'll have an idea of what witnessing the Topics in Marine Science class was like. The lectures consisted of visiting ocean scientists and professionals just discussing what they study and why, with an open floor for questions. Each presentation was filled with passion and connected ocean science to every other discipline imaginable, challenging you to think like a scientist on a planetary scale. I took the course as a distraction from my pre-medical courses but found it to be the course that gave me the most energy throughout my undergraduate years. I was humbled by seeing so many brilliant minds talk about things I didn't understand—but I tried to make time to ask, and every presenter was excited to teach in response.

The entire department is run with a philosophy of holistic science. Marine systems are interdisciplinary—you must know a degree of biology, chemistry, and physics to appreciate its influence and apply it to research questions. Every peer, mentor, and administrator I met at the Department of Marine and Coastal Sciences was supportive in teaching and in providing resources for my research and curriculum. As part of my degree I conducted my own research trying to connect exposure to harmful-algal-blooms to patient outcomes in the COVID-19 pandemic. The intersection of harmful-algal-blooms and human public health sounds like a niche topic, but I was quickly connected to researchers locally and across the country who had specialized in exactly what I was proposing.

It's amazing what one course can do to define your undergraduate years. I plan to apply my knowledge and experiences from my marine science degree as a physician, whether specifically in dive medicine, public health research, or as an educator. The scuba certification as an Open Water Diver was an unexpected bonus, but is also indicative of how Rutgers wants you to learn, and why it's such an amazing, forward-thinking center for learning."

DEVIN BUSONO

"Unlike many other marine science students, I was fixed on a career in medicine prior to starting college, so I was looking for a different field of study that would let me broaden my horizons. The first thing to catch my attention about the Department of Marine and Coastal Sciences was the international research opportunities. Being able to travel and experience different countries and cultures at the same time as doing research was the cherry on top. The small student to faculty ratio of the department also impressed me, as I knew I would be getting personalized advising and easy access to professors outside of class. On top of that, the department's course offerings had great variety, and many courses integrated field experience into their curricula, which provided a great way for students to practice what they learn.

Four years later, now with a marine biology degree in hand, I look back on what made me want to study Marine Sciences at Rutgers. The curriculum provided me with some awesome, unique opportunities to go out on the water and learn about the basics of marine field work. Many of my cohort were able to participate in research trips to the Caribbean, Asia, and even Antarctica. But perhaps what I found most invaluable were the department connections I made, facilitated by the close community feel within the department. The relationships I made through the department were a large part of my great experience studying marine biology at Rutgers. Wherever I may end up, I'm proud to call myself a graduate of the Rutgers Oceanography program!"

CHRISTINA MALYSHKO

"I can say without a doubt being a marine science major at Rutgers changed my life. Through my four years in the program, the community I built, the opportunities I was given, and the memories I have made are all something that leave me longing to have just one more semester at my second home with my best friends. I have been able to travel to the Cayman Islands to study coral conservation, study the phytoplankton in Antarctica using world class ocean tech, and look at zooplankton skeletons to track climate change through the millennia all while having my time cut short with a global pandemic, so just imagine the experiences one could build in a full in-person four years. With my Rutgers experiences, I was able to get a job as a lab tech before I graduated. I am now working in an animal neurobiology lab at Lehigh University and I am prepping to start a Ph.D. program working in animal ecology with a focus on climate change. If life doesn't have too many more surprises, I plan to ultimately work as a marine ecology professor at a university like Rutgers to be able to provide future marine biology nerds a similar life changing undergraduate career like mine."

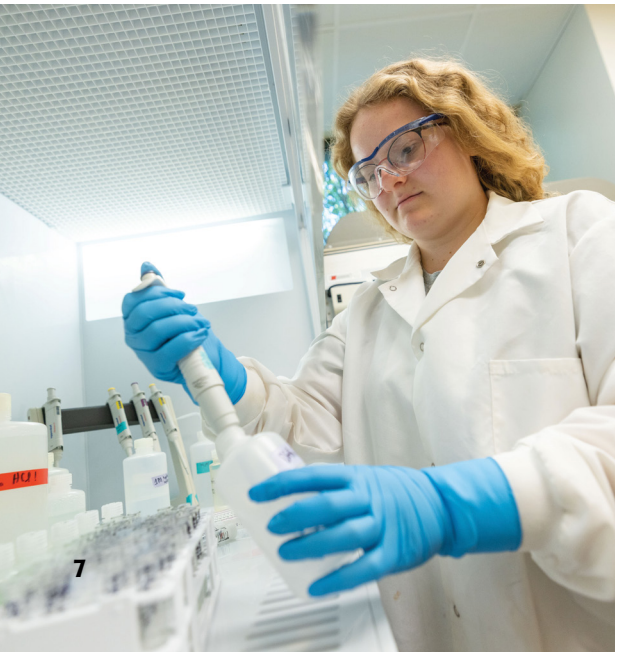
EMILY BUSCH

"Studying Marine Science at Rutgers has provided me with more hands-on experience and valuable scientific knowledge than I could have ever imagined. Not only did I meet enthusiastic and passionate students like myself, I was also fortunate enough to meet several professors that inspired me and guided me towards success. Although I transferred to Rutgers during a global pandemic, just one year at the Department of Marine and Coastal Sciences allowed me to get my hands dirty and become comfortable working with marine equipment. The opportunities available for both undergraduate and graduate students at Rutgers has been consistent and plentiful. I truly believe Rutgers provided me with the skills necessary to let me excel in this field.

This upcoming semester I look forward to returning to Rutgers to pursue my Masters in Operational Oceanography, where I will be working with integrated ocean software and data interpretation. I cannot speak of my experience at Rutgers highly enough, and encourage anyone interested in attending Rutgers to become a part of the DMCS team."

CAREERS IN MARINE SCIENCES

Our students have found employment in a broad range of marine and environmental science fields, civil service careers in environmental management and consulting, or teaching in secondary schools. Further, the interdisciplinary coursework prepares students for graduate studies in oceanography, or one of the basic science disciplines.



The Marine Science curriculum emphasizes the improvement of oral and written communication skills, and competency in reading, understanding and synthesizing scientific literature. Courses at all levels emphasize hands-on learning in the laboratory and in the field. The program includes five different options, allowing students to explore a particular field of study aligned with their interests:

MARINE BIOLOGY/BIOLOGICAL OCEANOGRAPHY

Courses focus on biological organization at the molecular, cellular, organismic, community, and ecosystem level. Depending on the electives chosen, students may fulfill the requirements for a second major in Biological Sciences or Ecology and Evolution. Current challenges include the loss of biological diversity, sustainable fishing, or changes in marine ecosystems due to climate change.

MARINE CHEMISTRY

The coursework covers inorganic, organic and analytical chemistry. It explores the chemistry of the ocean at the interface of biology, geology, and physics. Current challenges include ocean acidification, the expansion of anoxic "dead zones" in coastal areas, microplastic pollution, and the ocean's capacity to store anthropogenic CO_2.

PHYSICAL OCEANOGRAPHY

This course of study focuses on large scale ocean circulation, costal systems, ocean observing technologies, and ocean-climate modeling. Current challenges include air-sea interactions and their effects on hurricanes, large-scale changes in ocean circulation, polar ice sheet retreat, storm surges, coastal and estuarine dynamics and erosion.

MARINE GEOLOGY

Courses cover all aspects of geology, such as sedimentology, mineralogy, geophysics, structural geology, hydrogeology, and evolution of the Earth's ocean and atmosphere. Current challenges include sea-level rise, deep-sea mining of precious metals, reconstruction of past climate change, and "geoengineering" solutions to reduce the effects of anthropogenic CO_2 emissions.

DIRECTED MARINE STUDIES

The Directed Marine Studies program most closely resembles the Marine Biology option but includes a requirement to complete a minor or certificate program that facilitate employment following graduation. This option is only available to students in the School of Environmental and Biological Sciences.

Sunrise in Antarctica where Rutgers scientists have been studying how climate change is affecting the ecology for over 15 years.

Postdoctoral researcher Jessica Valenti at Rutgers Marine field station prepares nets as part of long term studies of the changes being observed along the New Jersey coastline.

The Department also offers an array of minors to give students an advantage in their professional pursuits:

Rutgers Marine Science Minor

The minor is offered for students who wish to show that their studies included a focus on some aspects of marine science.

Rutgers Fisheries Minor

This program provides a deeper understanding of the ecology of fish and humans, and outlines the international policies and regulations that govern fisheries. The goal is to provide an overview of fisheries as a complex system, which sets students up for a wide range of careers in the industry.

RUTGERS MASTER'S DEGREE PROGRAM IN OPERATIONAL OCEANOGRAPHY

This new **Master of Science Degree in Oceanography** is available to Marine Science students as a **4+1 program**, allowing students to earn a master's degree in 12 months after completing their undergraduate degree. Today's students will be challenged over their professional lifetimes to provide society with 60% more food, 55% more water, and 80% more energy for a growing global population forecast to exceed 9 billion by 2050. In just 1 year, our students build the skills necessary to address this challenge and engage with technology and professionals. Graduates of the program can take on and solve real world problems in operational oceanography's core research areas (hurricane science, offshore wind, ocean acidification, polar science, and integrated ocean technology). The intensive program's small class sizes and hands-on focus provide experience using cutting-edge ocean technology including gliders and HF (high frequencies) radar, mastering marine data analytics and software programming, and collaborating with experts in the field. These experiences with emerging technologies and forecasting tools allow the graduates to be well-equipped for careers in the energy sector, maritime industry, government agencies, research organizations, or non-profit organizations.

Kicking off with an immersive ocean observing summer experience, students continue through two semesters of coursework and research, culminating with an applied thesis submission and defense in the second summer. Each semester includes three (3-credit) courses that cover a wide range of ocean observing technologies and include both lecture and hands-on laboratory components. Students also develop thesis projects with a faculty mentor through independent research courses (3-credits) during each semester.

Rutgers students exploring the ocean on campus in the Center of Ocean Observing Leadership..

Ultramodern facilities provide a backdrop for experiential learning, scientific inquiry, and collaboration throughout a student's time at Rutgers. Some of the labs and centers where Marine Science students thrive are:

THE RUTGERS UNIVERSITY MARINE FIELD STATION (RUMFS)

Founded in 1972, RUMFS is a research lab situated in the pristine Mullica River-Great Bay estuary. It is an exceptionally productive estuarine system for shellfish and finfish and has been a research focal point since the late 1890s. Many undergraduates spend large portions of their student careers learning and working at the field station.

THE HASKIN SHELLFISH RESEARCH LABORATORY (HSRL)

The Haskin lab has a long tradition of disseminating research results related to all aspects of fisheries and aquaculture science since its founding in 1888, concentrating on species of commercial importance to New Jersey. HSRL works cooperatively with state and federal agencies and the fisheries and aquaculture communities in New Jersey, making it an exceptional resource for support and an international leader in aquaculture research.

RUTGERS UNIVERSITY FISHERIES CENTER

Rutgers scientists collaborate with commercial and recreational fishermen to improve the sustainability of wild fisheries and aquaculture. Their focus is on locally important species like summer flounder, black sea bass, and oysters. Researchers at the Fisheries Center collect global statistics to analyze the industry's response to threats such as climate change and overfishing.

Rutgers University is a land grant college with an expansive network of centers and institutes operated under the New Jersey Agricultural Experiment Station. University-wide initiatives allow students to explore fields allied with marine science, and to be engaged in research opportunities, paid internships, and unique team efforts in other sciences.

RUTGERS UNIVERSITY CENTER FOR OCEAN OBSERVING LEADERSHIP (RU COOL)

Founded in 1992, RU COOL is at the forefront of the development, deployment, and operation of ocean observing technologies. RU COOL manages an extensive satellite system, the country's largest high frequency radar network, and a fleet of underwater robots. Data streamed directly into the classroom connects students to the important discoveries that researchers are making daily.

THE RUTGERS ENERGY INSTITUTE (REI)

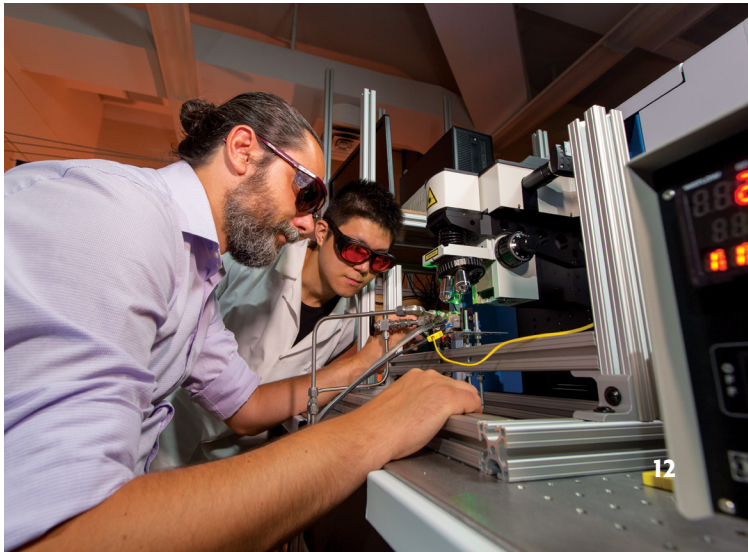
The Rutgers Energy Institute is engaged in four principal areas of activity: student scholarship, fundamental and applied research, outreach to the community, and policy advice to government, business, and civic leaders. The Institute's mission is to develop sustainable energy production compatible with economic growth and environmental vitality.

THE RUTGERS INSTITUTE OF EARTH, OCEAN, AND ATMOSPHERIC SCIENCES (EOAS)

Faculty, students, and researchers at the Rutgers Institute of Earth, Ocean and Atmospheric Sciences collaborate to address some of the most pressing scientific challenges of the 21st century. They bring together field observations, geological and biological sampling, state -of-the-art laboratory analysis, and advanced computation to study the Earth, its history, and the future of human civilization.

THE RUTGERS SUSTAINABLE RARITAN RIVER INITIATIVE (SRRI)

The Rutgers Sustainable Raritan River Initiative (SRRI) launched in 2009 to unite concerned scientists, environmentalists, engineers, businesses, community leaders and government entities to restore and preserve New Jersey's Raritan River. SRRI is a collective effort of multiple schools and departments on the university's New Brunswick campus to coordinate activities and projects that have students exploring, researching, and traveling through the Raritan watershed.



SCUBA AT RUTGERS

Rutgers University is a 5 Star Instructor Development Center with the Professional Association of Dive Instructors (PADI); an organizational member of the American Academy of Underwater Sciences (AAUS); a business member of Divers Alert Network (DAN); and a member of The Diving Equipment and Marketing Association (DEMA).

The scuba program at Rutgers University provides students, faculty, staff, and community members the opportunity to expand their personal and professional skills in exploring underwater environments by offering a variety of scuba diving courses and experiences. Offerings include Discover scuba Diving experiences, academic Basic scuba Diving and Scientific Diving courses, recreational Open Water Diver, Advanced, Rescue and Specialty Diver classes, or professional dive training for Divemasters and scuba Instructors. The scuba program incorporates dive training in Rutgers University swimming pools, local diving environments, and transformative group dive trips, both domestically and internationally.

The Department of Marine and Coastal Sciences offers Basic scuba Diving (11:628:230) each semester for students interested in learning to scuba dive. This is an experiential learning course that teaches students the basics of scuba, diving in an underwater environment, knowledge development, safe diving practices, and confined water skills required to become a certified PADI Open Water Diver. Scientific Diving I and II (11:628:345 and 11:628:346) are advanced courses for students wishing to pursue marine, environmental, or ecology science research diving to become an AAUS Scientific Diver. Scientific Divers learn more advanced dive skills in buoyancy, underwater navigation, search and recovery, deep diving, dive rescue, dive planning, CPR, First Aid, Neurological Assessment and Emergency Oxygen administration, and emergency assistance planning. Scientific Divers develop more in-depth knowledge of dive theory in physics, physiology, dive environments, dive equipment, decompression management, and research team safety regulations.

What About Financial Aid?

Rutgers University offers a comprehensive program of federal and state grants, loans, and work-study jobs, based on financial need and scholastic achievement. Please visit the Rutgers Office of Financial Aid at *financialaid.rutgers.edu* for more information.

Why Rutgers?

The Department of Marine and Coastal Sciences at Rutgers University delivers a small school feel with the benefits of a comprehensive and innovative research institution.

We invite you to join our team. To learn more about our program, watch a student-created video at *rucool.marine.rutgers.edu/academics/why-study-at-rutgers*. Meet some of your future mentors by checking out these films starring Rutgers Marine Science faculty:

Antarctic Edge 70° South
A group of world-class researchers is in a race to understand climate change in the fastest winter-warming place on earth: the West Antarctic Peninsula.

Atlantic Crossing – A Robot's Daring Mission
The story of a passionate band of scientists led by world-renowned oceanographer Scott Glenn, who successfully navigate the first autonomous underwater robot across the Atlantic Ocean.

Volcanoes of the Deep Sea
Alvin, a deep-sea mechanized probe, voyages 12,000 feet underwater to explore the Azores, an erupting volcanic rift between Europe and North America.

To view all three videos visit: *marine.rutgers.edu/about-us/movies-media*

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Field team in Antarctica getting ready to deploy for field surveys from a US research vessel.

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