

## **Application for membership in the North Atlantic Coast**

### **Cooperative Ecosystems Study Unit**

#### **Submitted by**

**The Marine Sciences Research Center  
Stony Brook University  
Stony Brook, NY 11794-5000**

**David O. Conover, Dean and Director**

#### *The Marine Sciences Research Center*

The Marine Sciences Research Center (MSRC) of Stony Brook University is the center for research, education, and public service in the marine sciences for the State University of New York (SUNY) system, which presently encompasses 64 campuses with a total student enrollment of approximately 403,000. MSRC was created by the SUNY Board of Trustees in 1965; the first appointments to the Center's faculty were in 1968. In 1992, Stony Brook's Institute for Terrestrial and Planetary Atmospheres was transferred to MSRC. There are presently about 42 full-time faculty at the Center. Graduate programs offered at the Center are a doctoral program in marine and atmospheric sciences (concentrations in oceanography or atmospheric sciences) and a masters program in marine environmental sciences. In a nation-wide comparison of Ph.D. programs conducted by the National Research Council (NRC), MSRC was ranked 8<sup>th</sup> out of 35 programs in oceanography. MSRC offers two undergraduate majors: atmospheric/oceanic sciences (B.S.) and environmental studies (B.A.), as well as minors in marine sciences and environmental studies. Within the Center, several institutes focus on programs and activities in selected high priority areas. These institutes, which are fully integrated into the administrative and programmatic structure of the Center, include the aforementioned Institute for Terrestrial and Planetary Atmospheres (ITPA), along with the Living Marine Resources Institute (LIMRI), the Waste Reduction and Management Institute (WRMI), the Marine Disease Pathology and Research Consortium, and the Long Island Groundwater Research Institute, a collaborative program with the University's Department of Geosciences. The Center operates a seaside laboratory, the Flax Pond Marine Laboratory, located on a salt marsh approximately 5 miles north of the campus, an 80 ft research vessel, the RV Seawolf, and a fleet of smaller boats.

### *MSRC's Mission*

The Center has a tripartite mission: 1) to conduct fundamental and problem-directed research on marine and coastal environments and the atmosphere; 2) to train future marine and atmospheric scientists through graduate and undergraduate education programs; and 3) to provide information on marine and atmospheric environments to other segments of society--government, private, and the general public--in an effort to improve the long-term sustainability of marine resources and ecosystems. In its 35-year history, MSRC has worked extensively with federal, state, and local environmental agencies to explicate and resolve issues involving coastal environments and resources.

### *Stony Brook University -- The Home of MSRC*

Stony Brook University has more than 20,000 students, including more than 13,000 undergraduates and nearly 7,000 graduate students. Stony Brook offers 119 undergraduate majors and minors, 102 master's programs, 40 doctoral programs, and 32 graduate certificate programs. The Health Sciences Center provides undergraduate and graduate education to more than 2,300 students in medicine and health professions. Stony Brook has ten doctoral programs ranked in the top 40 nationwide, with two in the top ten, and four in the top 20. SBU was recently invited to become one of 63 members of the prestigious Association of American Universities (AAU).

### *Expertise Applicable to NAC CESU*

The coastal region of Southern New England and the Mid-Atlantic features a diversity of ecosystems in relatively close proximity to areas of dense human habitation. These systems and the living and non-living resources they contain are affected by a welter of human activities, resource uses, and influences. To effectively investigate and understand the conflict between ecosystem function and coastal development, a multi-disciplinary systems-based approach is required. Such multi-disciplinary research, drawing on the expertise of many faculty members and allied SBU departments, has been a hallmark of MSRC's research since the program's inception. Fundamental knowledge of basic oceanographic and atmospheric processes is an important component of the research conducted by MSRC faculty. However, as a state-funded institution, MSRC has also directed much of its research to practical resource management issues and problems of New York and the Southern New England/mid-Atlantic region. MSRC faculty often work collaboratively with scientists from other regional colleges and universities as well as federal and state government.

Much of MSRC's research focuses on the diverse array of coastal and marine habitats that are found within New York's marine and estuarine waters. Of special

interest to the NAC-CESU is the existence of numerous Department of Interior properties that exist on Long Island. These include a complex of National Wildlife Refuges including the Amagansett National Wildlife Refuge, Conscience Point National Wildlife Refuge, Lido Beach Wildlife Management Area, E. A. Morton National Wildlife Refuge, Oyster Bay National Wildlife Refuge, Sayville National Wildlife Refuge, Seatuck National Wildlife Refuge, Target Rock National Wildlife Refuge, and Wertheim National Wildlife Refuge. In addition, there is the Fire Island National Seashore (FINS), and the Gateway National Recreation Area which encompasses much of Jamaica Bay. MSRC faculty have conducted research on many of these areas and we are enthusiastic about expanding our research to focus more attention on these sites because they represent some of New York's most pristine coastal habitats. Indeed, MSRC has recently opened discussions about research needs of the FINS with the new Superintendent, David Spirtes.

MSRC maintains broad programs of research covering all the traditional subdisciplines of marine science including biological, physical, chemical, geological, and fisheries oceanography, as well as atmospheric science. However, the research and educational programs of MSRC focus on a range of environmental problems that require integration of knowledge and information across rather than within these disciplines. Because our faculty often work in teams, nearly all of them may at one time or another become involved in CESU activities. A list of our faculty with their areas of expertise are listed on an attached page. The following areas of research emphasis likely to be of greatest potential interest to the federal agencies who are part of NAC CESU are as follows:

#### *Environmental Modeling and Prediction*

Quantitative analysis of marine and atmospheric systems is an important part of MSRC research. Our faculty are involved in a diversity of research efforts that employ modeling and other quantitative tools to better understand and predict oceanographic, atmospheric and ecological processes. By combining mathematical models and empirical data, MSRC faculty gain insight into the causes and consequences of natural phenomena and human disturbances. Here are a few examples of current quantitative research at MSRC:

- Understanding the causes and consequences large-scale oceanographic phenomena
- Role of oceanic processes on global carbon cycles
- Evaluating mechanisms of climate change
- Exploring the impact of physical circulation and oceanographic features on biological resources
- Assessing anthropogenic impacts on food web dynamics
- Predicting regional weather from meso-scale models

## [Patterns and Impacts of Climate Change](#)

Human activities have altered the Earth's atmospheric composition and its land surface to a sufficient degree that world climates are likely changing as well. It is certainly no longer controversial that human activities have increased atmospheric greenhouse gases, pollutants, and aerosols; nor is it deniable that we have dramatically changed Earth's vegetation and other landscape characteristics. Under these conditions, questions about how the world climate system and its natural variability interact with human forcings are major concerns to the society. Several scientists at MSRC are carrying out research to quantify the human forcing of climate, to detect the signals and pattern of climate change, and to understand how the climate system works through numerical simulations. Other researchers are more focused on the impacts of climate change on Earth's physical and biological regimes. Around the globe, shifting temperature, precipitation, and storm patterns are driving significant changes in continental runoff, coastal hydrology, and species abundance and distributions. Understanding the links between natural variability, climate change, and human forcings are key to developing rational strategies for such environmental changes.

## [Environmental Health and Contaminants](#)

The presence of chemicals and pathogens in the environment is of great concern to both ecosystem and human health, yet the source, fates, and effects of these contaminants are often not well known. In collaboration with colleagues in the Stony Brook Health Sciences Center, Brookhaven National Laboratory, and Cornell's Veterinary School, MSRC faculty are actively investigating these and other environmental health issues. Three different institutes at Stony Brook University conduct research in the areas of environmental health. These are the Marine Animal Disease Laboratory, the Waste Reduction and Management Institute, and Center for Environmental Molecular Science (in Geosciences). Principal areas of research include:

- Pathology and parasitology of marine fish and shellfish
- Sources and assessment of sediment toxicity
- Fates and effects of endocrine disruptors, pharmaceuticals and personal care products in the environments
- Impact of groundwater discharges on coastal water quality
- Bioavailability, food chain transfer and effects of contaminants in marine invertebrates and fish

## [Conservation and Management of Marine Resources](#)

Humans have widespread effects on marine environments, ranging from the indirect effects of land-use on coastal water quality, to the direct effects of exploitation. MSRC faculty are interested in gaining a better understanding these effects and in trying to develop improved management policies. Research interests include

identifying the causes and effects of brown tides, understanding shellfish dynamics, exploring causes of disease outbreaks, assessing how aquatic organisms interact with toxic chemicals in their environment, establishing marine wilderness areas, determining the effect of disease on population dynamics of resource species, and identifying the evolutionary and ecological effects of fisheries. These efforts involve close collaboration with state and federal management agencies, such as the New York Department of Environmental Conservation and the U.S. National Marine Fisheries Service. The Living Marine Resources Institute (LIMRI) coordinates MSRC's fisheries and marine conservation research.

### *Biogeochemical Transformation of Energy and Elements*

Anthropogenic alteration of biogeochemical processes such as carbon and nitrogen cycling is thought to be causing a variety of changes to Earth's biosphere. Faculty at MSRC are working both on projects designed to produce a mechanistic understanding of how energy and nutrients are transformed from one form to another as they pass through marine ecosystems, and on using that new information to discover approaches to mitigate the pressing environmental problems that result from human activities. These projects include studies of the sources, transformations, fates, and fluxes of various organic and inorganic compounds in both planktonic and benthic systems, as well as studies of the relationships between the genetic and physiological diversity of marine microorganisms and the physical and biological processes that structure their habitats, including food web interactions. These efforts are focused at scales ranging from the water quality of a local embayments over seasons and years, to changes in global climate over years and decades.

### *Summary*

MSRC has considerable strengths in the multitude of disciplines necessary to conduct marine ecosystem research such as that envisioned for CESU institutions. It is located on the main campus of one of the top research universities in the U.S. It is located on an island with one of the steepest gradients in human density found anywhere in the world – from New York City at the western tip, to the pristine waters of Peconic Bay and Montauk at the eastern end. There is no better natural laboratory to study the interaction between humans and marine ecosystems.

**For more information please visit our web page at: <http://www.msrc.sunysb.edu>**

*NAC CESU Point of Contact at MSRC*

David O. Conover, Dean and Director  
Professor of Marine Science  
Marine Sciences Research Center  
Stony Brook University  
Stony Brook, NY 11794-5000  
email: [dconover@notes.cc.sunysb.edu](mailto:dconover@notes.cc.sunysb.edu)  
voice: 631-632-8781  
fax: 631-632-8915  
MSRC web page: <http://www.msrc.sunysb.edu>

## ***MSRC Faculty Profiles***

[Josephine Y. Aller](#)

Marine benthic ecology, invertebrate zoology, marine microbiology, biogeochemistry

[Robert C. Aller](#)

Marine geochemistry, marine animal-sediment relations.

[Robert Armstrong](#)

Mathematical modeling in marine ecology and biogeochemistry

[Stephen B. Baines](#)

Aquatic biogeochemistry of carbon and trace elements

[Henry J. Bokuniewicz](#)

Near shore transport processes, coastal groundwater hydrology, coastal sedimentation, marine geophysics

[Malcolm J. Bowman](#)

Coastal ocean and estuarine dynamics

[Bruce J. Brownawell](#)

Biogeochemistry of organic pollutants in seawater and groundwater.

[Robert M. Cerrato](#)

Benthic ecology, population and community dynamics.

[Robert D. Cess](#)

Atmospheric sciences and climate.

[Edmund K.M. Chang](#)

Atmospheric dynamics and diagnoses, climate dynamics, synoptic meteorology

[J. Kirk Cochran](#)

Marine geo-chemistry, use of radionuclides as geochemical tracers; diagenesis of marine sediments.

[Brian A. Colle](#)

Synoptic meteorology, mesoscale numerical modeling and forecasting, coastal meteorology

[Jackie L. Collier](#)

Phytoplankton physiological ecology; Biocomplexity and microbial diversity; Planktonic ecosystem processes in marine, estuarine, and freshwater systems

[David O. Conover](#)

Ecology of fishes, fisheries biology

[Robert L. de Zafra](#)

Remote measurements of stratospheric trace gases

[Alistair Dove](#)

Pathology, Taxonomy, Life cycles/Ecology.

[Tim Essington](#)

Fish Ecology, Marine Food Webs, Predator-Prey Interactions Fisheries Management.

[Nicholas S. Fisher](#)

Marine phytoplankton physiology and ecology, biogeo-chemistry of metals, marine pollution

[Roger D. Flood](#)

Marine geology, sediment dynamics, continental margin sedimentation

[Jane L. Fox](#)

Structure and evolution of thermospheres-ionospheres of planets

[Marvin A. Geller](#)

Atmosphere dynamics; stratosphere/mesosphere; climate

[Steven L. Goodbred, Jr.](#)

Coastal and marine sedimentology, Quaternary development of continental margins, salt-marsh processes and responses

[Sultan Hameed](#)

Climate change: analysis, impacts, and predictability

[Paul F. Kemp](#)

Growth and activity of marine microbes in water column and sediment; benthic-pelagic interactions; molecular ecology of marine bacteria

[Cindy Lee](#)

Ocean carbon cycle, marine geochemistry of organic compounds, organic and inorganic nitrogen-cycle biochemistry silicate and carbonate biomineralization

[Darcy J. Lonsdale](#)

Ecology and physiology of marine zooplankton; food web dynamics of estuarine plankton and the impacts of harmful algal blooms.

[Glenn R. Lopez](#)

Marine benthic ecology, animal-sediment interactions

[Kamazima M.M. Lwiza](#)

Structure and dynamics of shelf-seas and remote sensing oceanography

[John E. Mak](#)

Stable and radioisotopes as tracers of chemistry, origin, and transport in marine and atmospheric environments

[Jack Mattice](#)

Invertebrate zoology, physiological ecology, population biology, aquatic toxicology

[Anne McElroy](#)

Aquatic Toxicology

[Sergey A. Piontkovski](#)

Water column ecology, physical-biological coupling in coastal and oceanic ecosystems, behavior of zooplankton organisms

[Frank J. Roethel](#)

Environmental chemistry, Municipal solid waste management impacts

[Sergio A. Sanudo Wilhelmy](#)

Geochemical cycles of trace elements, marine pollution

[Mary I. Scranton](#)

Marine geochemistry, biological-chemical interactions in seawater

[Pete Strutton](#)

Phytoplankton Productivity, Biological-Physical Coupling

[R. Lawrence Swanson](#)

Recycling and reuse of waste materials, waste management

[Gordon T. Taylor](#)

Marine microbiology; interests in microbial ecology, plankton trophodynamics, biofouling

[Prasad Varanasi](#)

Atmospheric spectroscopy; remote sensing; global warming

[Duane E. Waliser](#)

Ocean-atmosphere interactions, tropical climate dynamics

[Dong-Ping Wang](#)

Coastal ocean dynamics

[Robert E. Wilson](#)

Estuarine and coastal ocean dynamics

[Pete Woodhead](#)

Behavior and physiology of fish, coral reef ecology, ocean energy conversion systems

[Minghua Zhang](#)

Climate modelling, atmospheric dynamics