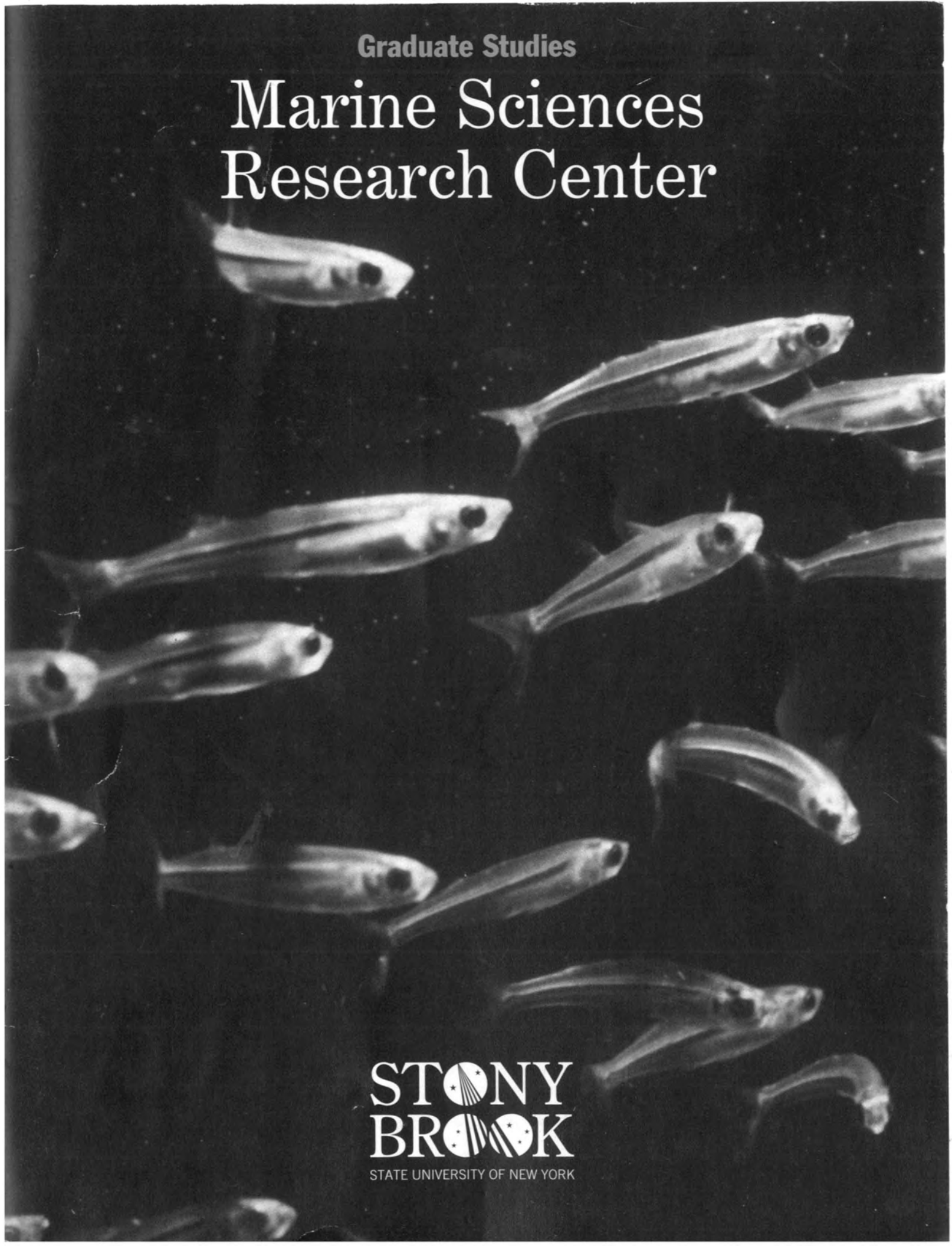
Graduate Studies

Marine Sciences Research Center



STONY BROOK

STATE UNIVERSITY OF NEW YORK

Director's Message

Marvin Geller, Dean and Director, Marine Sciences Research Center

PERSPECTIVES, **PAGE 30**
A student sets up a box corer for sediment studies at the mouth of the Amazon River, Brazil.

I was honored to be selected as the dean and director of the Marine Sciences Research Center (MSRC) at the beginning of 1998. In its 30 years of existence, the MSRC has established itself as one of the leading marine sciences research and educational programs in the world (ranked eighth in the United States by the most recent National Research Council study). This is a tribute to those faculty and students who have worked and studied at the MSRC. Its location on the North Shore of Long Island, about 60 miles east of New York City, places it close to one of the world's great cities, with all of the environmental stresses that such a population center implies. It also lies to the west of sparsely populated agricultural land, and is surrounded by some of the best beaches in the world and waters that yield great quantities of fin and shellfish. There is no better location from which to study the interplay of marine environments with human activities. The MSRC also studies marine and atmospheric problems that range from the frozen environments of the North and South poles to the tropical Caribbean and the Amazon. It is the goal of the MSRC to improve the scientific understanding of marine environments and the atmosphere and to apply this understanding to the solution of some of the world's most pressing environmental problems. We invite you to join us in this exciting and fulfilling endeavor.

RESEARCH FACILITIES, **PAGE 9**
MSRC's research vessel, *Onrust*, on a cruise in New York Harbor.

Program Description

Larval swordfish collected off Cape Hatteras, North Carolina.

Students who know that time is always short, that hard work can be fun, and that learning can be exhilarating, will find themselves welcomed in the scholarly community that is the MSRC.

The First Year and Beyond

Students entering our graduate programs in marine sciences and atmospheric sciences experience a demanding and rewarding program of courses, seminars, and research. Their education proceeds by formal means such as required core courses, advanced and specialized courses, and more informally through interaction in laboratory and field settings with faculty and advanced graduate students. Weekly seminars expose students and faculty to the latest research in marine and atmospheric sciences. Students will spend substantial time reading. Most first-year students are also assigned teaching assistantships. Teaching assistants work 20 hours a week assisting large undergraduate lecture or laboratory courses.

The most important goals for first-year students are to secure a solid introduction to marine or atmospheric sciences through core courses, to choose a research advisor, and to focus research interests. Faculty counselors assist students in finding possible research opportunities and help them to choose an advisor. Advanced graduate students are an important part of this process. The weekly seminar series introduces students to a larger community of scholars, and ensures that their education includes the most recent findings from all aspects of marine and atmospheric research. Advanced students are engaged in a rich program of research and courses.

A substantial amount of dedication is demanded of graduate students at the MSRC. Students who know that time is always short, that hard work can be fun, and that learning can be exhilarating, will find themselves welcomed in the scholarly community of faculty, students, and staff that is the Marine Sciences Research Center.

Center faculty conduct a broad range of basic and applied research in all facets of oceanography and atmospheric science throughout much of the world. The focus of many of the research programs is on the coastal ocean. Students at both the master's and doctoral degree levels are active participants in all phases of the center's research.

Specific Programs

Students entering the MSRC may pursue several different areas of research. The doctoral program in coastal oceanography prepares students to formulate and answer fundamental and applied problems in coastal oceanography through interdisciplinary training and close collaboration with faculty advisors. Success in the doctoral program requires a profound knowledge of the chosen research topic; since many questions in oceanography are inherently interdisciplinary, students often work across traditional academic boundaries.

The master's degree program in marine environmental sciences is designed to prepare students for effective careers in research, management, environmental protection, and resource development. The program provides students with a firm basis for more advanced study, but it is also designed to equip students with the background and tools needed for effective careers without additional training.

The Institute for Terrestrial and Planetary Atmospheres conducts a teaching and research program for students interested in the physics, chemistry, and dynamics of the atmospheres of Earth and other planets. The program of study begins with learning the fundamental principles of atmospheric sciences through core courses. At the same time, students are encouraged to join ongoing research activities. Completion of the degree program thus entails a thorough understanding of the principles of atmospheric science and their application to significant problems.

The Waste Reduction and Management Institute of the MSRC collaborates with the School of Professional Development and Continuing Studies to offer a graduate certificate program in waste management. This program is designed for professionals who confront the complex problems of waste management, and is especially important for those who consider access to the most current expertise in waste management essential to working effectively in their careers or public service activities.

The MSRC offers an advanced certificate program in oceanic science. This program offers supplemental, specialized training for visiting students. Certificates are awarded after completing two semesters in the program.

Graduate Course Offerings

MARINE ENVIRONMENTAL SCIENCES COURSES

PHYSICAL OCEANOGRAPHY *MAR 501, FALL*
Examines physics of ocean circulation and mixing on various scales with strong emphasis on profound effects of Earth's rotation on motions and distribution of properties. An introduction to physics of estuaries and other coastal water bodies.

BIOLOGICAL OCEANOGRAPHY *MAR 502, FALL*
A broad treatment of energy and nutrient cycling in coastal and open ocean environments. Introduction to organisms and habitats. Includes a student lab project to develop research skills.

CHEMICAL OCEANOGRAPHY *MAR 503, SPRING*
Introduction to chemical oceanography. Topics include origin and history of seawater, major and minor constituents, dissolved gases, the carbon dioxide system, distribution of properties in the world's oceans, isotope geochemistry, and estuarine and hydrothermal vent geochemistry.

GEOLOGICAL OCEANOGRAPHY *MAR 506, SPRING*
An introduction to the geological oceanography of the world's oceans with emphasis on the coastal environment; discussions of the physical processes controlling the structure and evolution of the ocean basins and continental margins, the distribution of marine sediment, and the development of coastal features.

MODELING TECHNIQUES IN CHEMICAL OCEANOGRAPHY
MAR 510, SPRING
Derivation of solutions to advection-diffusion-reaction equations for marine sediments and waters. One- and multi-dimensional models are developed for dissolved and solid-phase substances in Cartesian, cylindrical, and spherical coordinates. Effect of imposing multiple layers on these systems is examined.

Students examine a specimen while doing research out in the field.

MARINE POLLUTION *MAR 512, FALL*
Review of the physical and chemical characteristics and speciation in the marine environment of organic pollutants, metals, and radionuclides including bioavailability, assimilation by marine organisms, toxicity, and policy issues.

PHYTOPLANKTON ECOLOGY *MAR 515, SPRING*
The biology and ecology of marine phytoplankton. Covered are life cycles, growth, nutrient uptake, grazing, and the effects of environmental factors on growth and survival of phytoplankton. The characteristics of various classes are examined, and are related to environmental conditions.

GEOCHEMISTRY SEMINAR *MAR 519, FALL*
This course explores topics in low-temperature geochemistry as chosen by the instructors and participants. The seminar series is organized around a theme such as early diagenesis, estuarine geochemistry, or aquatic chemistry. Students are required to lead one of the seminars and to participate in discussions.

NEW PRODUCTION AND GEOCHEMICAL CYCLES
MAR 520, SPRING, ALTERNATE YEARS
Consideration of oceanic new production for a variety of ecosystems. Quantitative examination of the impact of new production on the transport and cycling of major and minor elements and pollutants.

ORGANIC CONTAMINANT HYDROLOGY *MAR 524, SPRING*
There are a host of chemical, biological, and physical processes that affect the transport and fate of organic chemicals in natural waters. This course is concerned with understanding these processes and the structure-activity relationships that are available for predicting their rates. The major focus of this class is on contaminant hydrology of soil and aquifer environments, and includes the principles behind remediation and containment technologies.

GLOBAL CHANGE *MAR 527, FALL, ALTERNATE YEARS*
The course examines the scientific basis behind questions of global change and some of the policy implications of changes to the region and country. Topics include evidence and courses of past climatic changes, greenhouse gases and the greenhouse effect, analogues with other planets, the Gaia hypothesis, climate modeling, and deforestation and the depletion of ozone.

OCEAN ATMOSPHERE INTERACTIONS
MAR 528, SPRING, ALTERNATE YEARS
This course discusses the fundamental physical mechanisms through which the ocean and atmosphere interact. These principles are applied to the understanding of phenomena, such as the El Niño Southern Oscillation, the effects of sea surface temperature on the distribution of low-level winds and development of tropical deep convection, and the effects of tropical deep convection and mid-latitude storms on the ocean's mixed layer. Both modeling and observational aspects are discussed. Material will be taken from selected textbooks, as well as recent literature.

Researchers sample water in the northern Atlantic Ocean for chemical studies.

ORGANIC GEOCHEMISTRY *MAR 530, FALL, ALTERNATE YEARS*
Introduction to the organic chemistry of the earth, oceans, and atmosphere. Topics include production, transformation and fate of organic matter; use of organic biomarkers, stable isotopes, and radioisotopes; diagenesis in recent sediments; oil and coal production and composition; dissolved and particulate organic matter in seawater.

INSTRUMENTAL ANALYSIS *MAR 533, SPRING*
Fundamental principles of instrumental chemical analysis and practical applications of molecular spectroscopy and atomic spectroscopy. These two instruments are widely used in environmental problem solving. Lectures cover basic concepts of chemical analysis and the fundamental principles of the analytical techniques to be used. In the laboratory, students gain hands-on experience both by performing a series of required basic chemical determinations nutrients and trace metals in sediments and in river water and by undertaking special projects. Students prepare written reports describing the methods, the theory underlying those methods, results, and figures of merit. Students also present their results orally in brief presentations.

PHYSIOLOGICAL ECOLOGY OF MARINE ORGANISMS *MAR 535, FALL*
An introduction to the physiological adaptations of marine organisms to environmental changes. Specific topics covered include responses to stress, temperature adaptation, genetic basis of physiological adaptation, resource partitioning, bioenergetics, and feeding models and resource limitation.

STATISTICAL METHODS FOR ATMOSPHERIC AND MARINE SCIENCES
MAR 538, FALL, ALTERNATE YEARS
An introduction to basic statistical concepts and their applications to analysis of data in atmospheric and marine sciences. The topics include distribution, statistical estimation, hypothesis testing, analysis of variance, linear and nonlinear regression analysis, and basics of experimental design. In-depth class discussions of the theoretical concepts are accompanied by extensive applications to data sets supplied by the instructor and the students.

BIOREMEDIATION *MAR 539, FALL, ALTERNATE YEARS*
The microbial and chemical processes that control the feasibility and design of bioremediation systems for the control of hazardous and nonhazardous wastes. Topics include processes; pathways and kinetics of microbial transformations; design of microbial reactor and in situ technologies and application of computer models for optimization; methods for assessing effectiveness of bioremediation; and case studies.

MARINE MICROBIAL ECOLOGY *MAR 540, FALL*
A historical perspective of the field, aspects of microbial nutrition and growth, metabolism, and trophodynamic relationships with other organisms. Emphasis on roles of microorganisms in marine environments such as salt marshes, estuaries, coastal pelagic ecosystems, and the deep sea, as well as microbial contribution to geochemical cycles. Contemporary and classical methodologies covered.

CONTINENTAL MARGIN SEDIMENTATION
MAR 545 FALL, ALTERNATE YEARS
Examination of the sedimentary processes active across continental margins including coastal environments, shelf, slope, and rise.

MARINE SEDIMENTOLOGY *MAR 546, FALL, ALTERNATE YEARS*
Study of sedimentology in the marine environment including an introduction to fluid mechanics, sediment transport theory, quantitative models of sedimentation, and dynamic stratigraphy.

OCEANOGRAPHIC PROBLEM SOLVING *MAR 547, FALL*
Course gives students experience in integrating information from different disciplines to address important oceanographic problems. Sessions are structured around problems of current interest to marine scientists and involve active student participation in small working groups as well as short written essays to be critiqued by faculty.

MARINE GEOPHYSICS *MAR 548, SPRING, ALTERNATE YEARS*
Fundamentals of geophysics applied to the study of the oceans, ocean basins, and coastal zone dynamics including heat flow, seismology, gravity, magnetics, fluid mechanics, and flow in porous media.

MIDDLE ATMOSPHERE DYNAMICS
MAR 549, FALL, ALTERNATE YEARS
This course is concerned with the dynamics of the Earth's neutral atmosphere above the troposphere; that is, the stratosphere, mesosphere, and lower thermosphere. Observational informa-

tion of the dynamics of the middle atmosphere is discussed, and theories of middle atmospheric motions are developed.

TOPICS IN MARINE SCIENCES *MAR 550, FALL AND SPRING*
This is used to present special interest courses, including intensive short courses by visiting and adjunct faculty and courses requested by students. Those given in recent years include Nature of Marine Ecosystems, Science and Technology in Public Institutions, Plutonium in the Marine Environment, and Problems in Estuarine Sedimentation.

FISHERY MANAGEMENT *MAR 553, SPRING, ALTERNATE YEARS*
Survey of the basic principles of and techniques for studying the population dynamics of marine fish and shellfish. Discussion of the theoretical basis for management of exploited fishes and shellfish, contrasting management in theory and in practice using local, national, and international examples. Includes lab exercises in the use of computer-based models for fish stock assessment.

INTRODUCTION TO MATHEMATICS FOR MARINE SCIENTISTS
MAR 555, FALL
Course is designed to assist non-math/physics majors who take required core courses as well as advanced courses in our program. Topics covered are differential equations, differential and integral calculus partial differential equations. Discussions include formulation of practical problems, i.e., application of differential equations.

BIOLOGY OF FISHES *MAR 556, FALL, ALTERNATE YEARS*
Lectures and laboratories on comparative evolution, morphology, physiology, and ecology of fishes with emphasis on marine and estuarine forms.

ECOLOGY OF FISHES *MAR 560, SPRING, ALTERNATE YEARS*
Introduction to current research in the ecology of fishes. Topics such as population regulation, migration, reproductive strategies, predator-prey interactions, feeding behavior, competition, life history strategies, and others are discussed.

Salt marsh grass, Spartina alterniflora.

EARLY DIAGENESIS OF MARINE SEDIMENTS
MAR 562, FALL, ALTERNATE YEARS
The course treats qualitative and quantitative aspects of the early diagenesis of sediments. Topics include diffusion and adsorption of dissolved species; organic matter decomposition and storage; and diagenesis of clay materials, sulfur compounds, and calcium carbonates. The effects of bioturbation on sediment diagenesis are also discussed.

EARLY DIAGENESIS OF MARINE SEDIMENTS II
MAR 563, SPRING, ALTERNATE YEARS
The basic principles and concepts of diagenetic processes developed in MAR/GEO 562 are used to examine in detail early diagenesis in a range of sedimentary environments. These include terrigenous and biogenic sediments from estuarine, lagoonal, deltaic, open shelf, hemipelagic, oligotrophic deep-sea, and hydrothermal regions.

TIME SERIES *MAR 570, FALL, ALTERNATE YEARS*
Sampling and experiment design considerations, time and frequency domain analysis, Fourier methods, related topics in probability and statistics.

ZOOPLANKTON ECOLOGY *MAR 571, SPRING, ALTERNATE YEARS*
The course is designed to acquaint the student with the theoretical problems and applied methodology in ecological studies of marine and freshwater zooplankton. Topics will include taxonomy, anatomy, physiology, life history strategies, population dynamics, and food chain interaction.

GEOPHYSICAL SIMULATION *MAR 572, FALL, ALTERNATE YEARS*
Basic equations and boundary conditions. Linear and nonlinear instabilities. Finite-difference and time integration techniques for problems in geophysical fluid dynamics. Numerical design of global atmospheric and ocean models.

SPECIAL TOPICS—CHEMICAL OCEANOGRAPHY *MAR 573, SPRING*
This course is designed for the discussion of topics of special interest, on demand, that are not covered in regularly scheduled courses. Examples of possible topics include carbonate chemistry, isotope chemistry, and microbial chemistry.

SPECIAL TOPICS—PHYSICAL OCEANOGRAPHY *MAR 574, FALL*
The course is designed for the discussion of topics of special interest, on demand, that are not covered in regularly scheduled courses. Examples of possible topics include diffusion or dispersion in the ocean.

SPECIAL TOPICS—GEOLOGICAL OCEANOGRAPHY *MAR 575, SPRING*
The course is designed for the discussion of topics of special interest, on demand, that are not covered in regularly scheduled courses. Examples of possible topics include coastal processes, fluvial processes, physics of sediment transport, and groundwater flow.

SPECIAL TOPICS—BIOLOGICAL OCEANOGRAPHY *MAR 576, FALL*
The course is designed for the discussion of topics of special interest, on demand, that are not covered in regularly scheduled courses. Examples of possible topics include grazing in benthic environments, coastal upwelling, and marine pollution processes.

SPECIAL TOPICS—COASTAL ZONE MANAGEMENT
MAR 577, FALL AND SPRING
The course is designed for the discussion of topics of special interest, on demand, that are not covered in regularly scheduled courses. Examples of possible topics include microcomputer information systems, environmental law, coastal pollution, dredge spoil disposal, science and technology in public institutions, and coastal marine policy.

COASTAL GEOLOGY SEMINAR *MAR 585, FALL*
An assessment of recent developments in coastal geology. Discussion of advances in the application of sedimentology, stratigraphy, and geomorphology to the study of coastal environments. Modern-ancient analogues are emphasized where appropriate.

RESEARCH *MAR 590, FALL AND SPRING*
Original investigation undertaken with the supervision of the advisor.

ATMOSPHERIC SCIENCE COURSES

ATMOSPHERIC RADIATION *MAR 544, FALL*
Discussion of the composition and radiative components of planetary atmospheres. Blackbody and gaseous radiation with emphasis upon the respective roles of electromagnetic theory and quantum statistics. Derivation of the equation of transfer and radiative exchange integrals, with application to energy transfer processes within the atmospheres of Earth and other planets.

ATMOSPHERIC MOLECULAR PROCESSES *MAR 591, SPRING*
Review of electromagnetic theory of scattering and spectroscopy in a manner appropriate for studies of planetary atmospheric phenomena involving gaseous molecules. A major portion is devoted to quantitative spectroscopic aspects of absorption of infrared radiation by planetary atmospheric gases. Spectral line shapes and band models.

THEORETICAL METEOROLOGY I *MAR 593, FALL*
Quantitative introduction to atmospheric thermodynamics, cloud physics, and radiative transfer; topics include the structure, stability, and energy balance of the atmosphere, and the formation of clouds and precipitation.

THEORETICAL METEOROLOGY II *MAR 594, SPRING*
Introduction to those elements of fluid dynamics and thermodynamics essential to understanding the large- and small-scale motions of the thermal atmosphere.

PLANETARY AERONOMY *MAR 595, SPRING*
This course focuses on the chemical and thermal structures of planetary atmospheres, especially upper atmospheres. The class discusses the ways that solar energy is absorbed and how it relates to the neutral and ionic composition, temperature, and airglow features of the atmosphere. The course also looks into the escape of species from the top of the atmosphere and atmospheric evolution.

PRINCIPLES OF ATMOSPHERIC CHEMISTRY *MAR 596, FALL*
The application of photochemistry and reaction kinetics to the atmospheres of the Earth and planets. The composition and structure of various regions of atmospheres, including the troposphere, stratosphere, and ionosphere. Incorporation of chemical rate processes and physical transport into models. Production of airglow and auroral emissions.

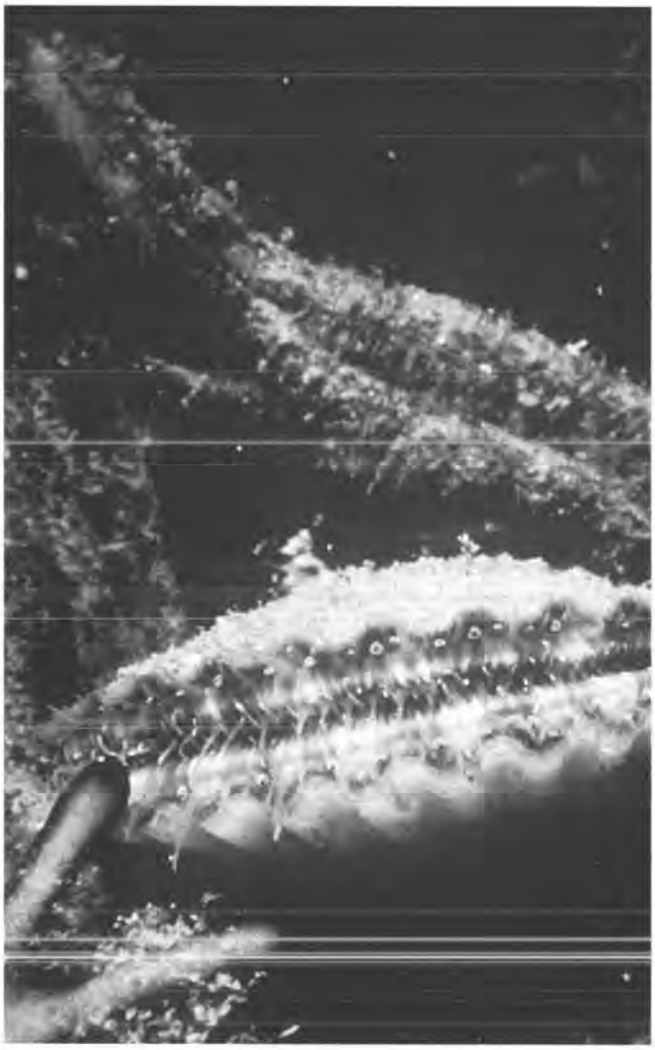
CLIMATE DYNAMICS *MAR 597, FALL*
Fundamentals of the observed climate system. Simple climatic models including energy balance models and radiative-convective models. Physical processes in the climate system and their quantitative simulations with emphasis on convection and clouds, radiation, soil temperature and moisture, snow and ice, etc. Introduction to numerical climate modeling.

COASTAL OCEANOGRAPHY COURSES

WAVES *OCN 610 SPRING*
Theory and observations of surface waves, internal waves, and planetary waves; wave-wave, wave-current, and wave-turbulence interactions; surface wave prediction; and beach processes.

DYNAMICAL OCEANOGRAPHY I *OCN 612, SPRING*
The first course in a two-course series on basic methods and results in dynamical oceanography. This course emphasizes unstratified fluids. Topics covered include but are not limited to basic conservation equations, effects of rotation, geostrophy, potential vorticity conservation, Ekman layers, and Ekman pumping.

Fecal coils produced by a deposit-feeding animal.



Bay scallop, Argopecten irradians, *in its natural habitat.*

DYNAMICAL OCEANOGRAPHY II *OCN 615, FALL*
Continuation of Dynamical Oceanography I. Course covers some of the basic effects of stratification. Topics include potential vorticity for baroclinic motion and baroclinic instability.

BENTHIC ECOLOGY *OCN 677, SPRING*
Ecological interactions of benthic organisms with their habitat. There are discussions of the nature of competition, predation, disturbance, and of life history and feeding strategies. Most of the course covers investigation of invertebrate fauna of coastal marine sediments, but there are discussions of intertidal, abyssal, and lacustrine habitats.

GRADUATE SEMINAR IN ATMOSPHERIC SCIENCES
OCN 694, FALL AND SPRING
Discussion of special research topics centered on monographs, conference proceedings, or journal articles. Topics include climate change, atmospheric chemistry, radiation transfer, and planetary atmospheres.

PH.D. RESEARCH *OCN 699, FALL AND SPRING*
Research course exclusively for students who have been advanced to candidacy in the Coastal Oceanography program.

CONTINUING EDUCATION COURSES

WASTE MANAGEMENT ISSUES *CEY 501/MAR 514, SPRING*
The course discusses waste management issues particularly affecting the marine environment. Topics include ocean dumping, sewage treatment fish kills, beach pollution, and nuisance algal blooms. Techniques for managing the waste stream are presented.

ENVIRONMENTAL LAW AND REGULATION *CEY 503/MAR 536, SPRING*
This course covers environmental law and regulations from inception in common law through statutory law and regulations. The initial approach entails the review of important case law giving rise to today's body of environmental regulations. Emphasis is on environmental statutes and regulations dealing with waterfront and coastal development and solid waste as well as New York State's Environmental Quality Review Act SEQRA and the National Environmental Policy Act NEPA.

ENVIRONMENTAL ENGINEERING *CEY 505/MAR 518, SPRING*
A technical, legal, and regulatory review of various aspects of environmental engineering. Problems of and solutions for managing water resources and air quality in an urban/suburban coastal environment are discussed.

GROUNDWATER PROBLEMS *CEY 507/MAR 521, SUMMER*
Discussion of the hydraulic processes and technologies that are central to the management and monitoring of groundwater resources, including special problems of coastal hydrology and saltwater intrusion, as well as the fate of contaminants. Remediation approaches are also examined.

ENVIRONMENT AND PUBLIC HEALTH *CEY 509/MAR 525, SPRING*
Review of the interactions of humans with the atmosphere and water resources, especially in the Long Island coastal community. An introduction is provided to the field of environmental health and the practices relevant to an urban/suburban and coastal setting.

SURVEY OF OCEANS *CEI 541/MAR 509, FALL AND SPRING*
Comprehensive survey of the oceanography of the world's oceans. The course will include a discussion of oceanographic methods and the interaction among the physics, biology, chemistry, and geology of the ocean.

Research Facilities

Beach seining for juvenile bluefish in Great South Bay, Long Island.

The laboratories, offices, and classrooms of the MSRC are housed in a cluster of buildings with approximately 90,000 square feet of usable floor space. Research laboratories of MSRC faculty are well equipped for a wide range of oceanographic and atmospheric research, including such research facilities as Fourier transform spectrometers and a tunable diode laser spectrometer, isotope ratio mass spectrometer for stable isotope analysis, a full range of instruments for natural abundance and radiotracer isotope analyses, side scan sonar, motion analysis, and quantitative fluorescence microscopy and image analysis. Other laboratories are fully equipped for metal and organic contaminant analyses, molecular biology, organic geochemistry, and microbial ecology.

Center-wide facilities at the MSRC include the Analytical Services Laboratory, which contains instrumentation for carbon, nitrogen, and sulfur in solid samples such as biological materials, sediments, and organic compounds (Carlo Erba EA-1108 Elemental Analyzer); dissolved total and organic carbon in water samples (Shimadzu TOC-5000); and dissolved nitrate, nitrite, phosphate, ammonia, and silica in marine and freshwater samples (TRAXX Analyzer).

The Electronics and Ocean Instrument Facility functions as a design shop, an instrumentation calibration facility, a central equipment pool, and a cruise support team. The calibration facility enhances the reliability of data obtained from field instruments in use at the MSRC. This facility includes a custom-built, 1,700-liter seawater bath for the calibration of salinity and temperature sensors.

Field Research Facilities and Opportunities

The MSRC manages Flax Pond, a 146-acre salt marsh preserve located five miles from campus. Flushed with tides through an inlet from Long Island Sound, the pond is surrounded by large estates and has retained a relatively pristine character. Flax Pond contains a wide variety of habitats, including tidal channels, thickets of marsh grasses, shrubs, trees, and unvegetated mud flats. The undisturbed nature of this preserve makes it an ideal research facility to study biological, geological, and geochemical processes. Approximately three-fourths of the marsh has been set aside for research and education, and activities that compete with research are prohibited. The MSRC has a well-equipped laboratory with a continuous seawater system. Laboratory and sea-table space are available to researchers. The Flax Pond Marine Field Station Laboratory has 8,000 square feet of usable space, a running seawater system that draws water from the pond to more than 20 sea-tables and aquaria, and an 800-square-foot greenhouse, also with running seawater.

To further explore coastal waters, the MSRC operates a 60-foot research vessel, the *Onrust*, designed specifically for oceanographic research. It is well outfitted for oceanographic sampling, featuring a hydraulic A-frame, 170-square-foot wet lab, and a through-hull mounting for an Acoustic Doppler Current Profiler. Her low freeboard, large lifting capacity, large work deck and laboratory, and state-of-the-art electronics make the RV *Onrust* well suited for coastal oceanographic research. The MSRC also maintains a fleet of smaller boats.

The Marine and Atmospheric Sciences Information Center

The Marine and Atmospheric Sciences Information Center (MASIC) is a branch of the campus library system located at the MSRC. Officially designated as a prototype for technology-based branch libraries on the campus, MASIC offers students and faculty a collection of journals and monographs relevant to the multidisciplinary pursuits of the Marine Sciences Research Center and its affiliated institutes. The holdings include important marine and atmospheric science core journals, beginning and advanced monographs and texts, key reprints, MSRC master's theses and doctoral dissertations, MSRC Special Reports and Technical Reports, nautical charts and maps, and a general science reference collection. In addition, MASIC operates its own local area network supporting CD-ROM–based databases that are appropriate to the varied studies at the MSRC. Students can also use MASIC to search the University's extensive holdings in oceanography, environmental, and basic sciences. Collectively, the University's libraries house over 1.7 million bound volumes.

Ethernet connections link equipment in the MSRC to most labs and offices, allowing communication among mainframe computers located in other departments, and, via the Internet, all over the world. High-speed modem lines allow users remote access to the MSRC facilities from off campus. Most faculty members have computers located in their labs, with software and hardware tailored to their individual research programs. Additional microcomputers and workstations for general use are located in clusters elsewhere on campus. All students have computer accounts with access to campus e-mail, news, and Web services.

Our Distinguished Faculty

The high national ranking of the center is a cumulative result of the reputations of its faculty. Research by MSRC faculty encompasses oceanographic and atmospheric processes throughout the world, and even reaches to other planets. Faculty interests cover the major disciplines in oceanography and atmospheric sciences, and are particularly strong in advancing the understanding of interdisciplinary processes. MSRC faculty are well known for work on material cycling in the ocean, including production and fate of organic matter, the roles of nitrogen fixation, sinking, advection, and microbial decay, and their consequences on biogeochemical processes.

Research requires that our faculty have diverse skills. Here MSRC associate professor Kamazima Lwiza deploys an ARGOS satellite track drifter in the Caribbean Sea.

MSRC biological oceanographers have also made notable achievements. Their insights on latitudinal variations, feeding ecology, roles of marine organisms in element cycling, and interactions between organisms and contaminants deserve special note. Geological research at the MSRC has led to better understanding of beach processes, shelf sediment transport, and deep seabed features. Other faculty focus on applied problems of waste management and amelioration.

MSRC faculty are also noted for their advances in the physics of oceans and atmospheres through measurements and modeling. Marine interests include turbulent transport and mixing. Atmospheric researchers have been instrumental in direct atmospheric measurements of gases and ozone and in improving climate models. Our faculty are proud of their accomplishments, and accept the challenge of keeping the MSRC at the forefront of marine and atmospheric science in the coming years.

Core Faculty Profiles

The 35 professors who make up the core faculty of the Marine Sciences Research Center are all dedicated teachers as well as highly respected researchers in their individual fields. The following profiles highlight some of our faculty's many accomplishments.

JOSEPHINE Y. ALLER, Associate Professor
Ph.D. 1975, University of Southern California

Josephine Aller's research interests concern (1) the importance of macrofauna and meiofauna on microbial activities; (2) the impact of physical disturbance on the structure and functioning of benthic communities in marine environments and the identification of biological indicators of those physical processes; and (3) the development of biosensors for the study of microbial processes in sediments.

Aller's research group continues to study the structure and dynamics of the benthic community in several continental shelf/slope environments including the Amazon, Cape Hatteras, and Papua New Guinea and in the deep sea. The group is interested in elucidating the major physical, chemical, and biological factors controlling diagenetic and benthic community patterns, evaluating the importance of biological activities to sedimentary and geochemical processes in these environments, and identifying biological indicators of these processes.

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ROBERT C. ALLER, Distinguished Professor
Ph.D. 1977, Yale University

Of interest to Robert Aller are the diagenetic reactions involving the decomposition of organic matter, inorganic biogenic debris, and the dissolution, mobilization, and reprecipitation of metals sensitive to oxidation/reduction. These reactions are most intense and rapid in the upper meter of marine sediment. It is in this upper zone where most benthic organisms live and where exchange of material between sediment and overlying water is largely determined. Knowledge of diagenetic processes occurring in this zone is, therefore, essential for understanding the chemistry of sediments and overlying water and the long-term recording of historical information in marine deposits.

Aller and his students are currently studying selected aspects of sediment diagenesis and exchange rates of dissolved material across the sediment-water interface in a variety of coastal and deep-sea marine areas, including Long Island Sound, the Amazon shelf, Papua New Guinea, French Guiana, and Cape Hatteras.

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HENRY BOKUNIEWICZ, Professor
Ph.D. 1976, Yale University

Henry Bokuniewicz's research is concerned primarily with the behavior of coastal geologic systems, including the fate of fine-grained sediment particles and coastal groundwater hydrology. He and his students do field work to study the transportation of fine-grained sediments in rivers and estuaries, shore changes and the partitioning of sediment particles at the shoreline, and the deposition of sediments and sedimentary evolution in coastal environments. They are now studying the evolution of Long Island Sound and the coastal processes on the South Shore of Long Island.

Much of this research is directly applicable to problems of coastal zone management. Bokuniewicz is interested in applying his research to the problems of shore erosion, the dispersion of contaminants, siltation, dredging and disposal of the dredged sediments, and marine mining. He is also currently the director of the University's Groundwater Resource Institute.

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MALCOLM J. BOWMAN, Professor
Ph.D. 1970, University of Saskatchewan

Focusing on the dynamics of coastal fronts, eddies, river plumes, island wakes, and coastal sea straits takes up much of Malcolm Bowman's time. His approach uses a combination of observations and model simulations to describe dynamically fundamental physical processes in shallow seas and estuaries. Bowman is particularly interested in how these processes control and influence the structure and production of the marine food chain from phytoplankton up to and including fish. Recent collaborative research has been conducted around Barbados, West Indies, to study the roles of island wake eddies and circulation in the life cycle of tropic reef fish. Another project is directed toward understanding the interactions and recirculation of the Hudson River plume as it flows into the New York Bight. He is also studying the oceanography of Doubtful Sound, a major fjord in New Zealand.

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VINCENT T. BRESLIN, Assistant Professor
Ph.D. 1986, Florida Institute of Technology

Vincent Breslin attempts to understand the mechanisms that influence the transport and leachability of contaminant metals associated with particles under various environmental conditions. He has developed research programs examining the behavior of contaminant metals associated with solid waste residues, soils, sediments, and suspended particulate matter. Currently, Breslin is involved in a multidisciplinary study examining the distribution and effects of ship-derived wastes in the sediments of western Lake Ontario. The research includes field studies on the distribution of ship-derived wastes and the possible effects of these wastes on benthic organisms.

Breslin has also developed research programs evaluating various municipal solid waste (MSW) treatment technologies. He is particularly interested in identifying the physical and chemical processes that act to retard contaminant leaching from stabilized combustion by-products.

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BRUCE BROWNAWELL, Associate Professor
Ph.D. 1986, Massachusetts Institute of Technology/Woods Hole Oceanographic Institution

Biogeochemical processes that affect the transport and fate of organic compounds in coastal, estuarine, and groundwater environments are of great concern to Bruce Brownawell. He focuses on the environmental chemistry of hydrophobic or amphiphilic organic compounds that are anthropogenically derived. His research group has worked on elucidating sources of organic contaminants to coastal waters, exchange processes across the sediment-water interface, microbial degradation of contaminants, and using particle-reactive contaminants as tracers of transport processes.

Brownawell's graduate students are currently working on relationships between the chemical and biological availability of sorbed hydrophobic chemicals. His research group has become interested in biogeochemical processes that act to protect both anthropogenic and naturally occurring compounds that are sorbed to geologic materials.

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EDWARD J. CARPENTER, Professor
Ph.D. 1969, North Carolina State University

Edward Carpenter's research group has two major interests. The first centers on the measurement of species-specific growth rates of phytoplankton. The group is attempting to determine factors that limit phytoplankton growth, as well as to understand the role of a species as a primary producer. This research requires a field program to collect phytoplankton and environmental data, and laboratory measurements using epifluorescence microscopy and video microscopy to measure DNA and cell cycle proteins quantitatively to determine growth rates.

The second major interest concerns nitrogen fixation in the sea. The group works in tropical and subtropical waters on the biology and ecology of nitrogen fixation in the cyanobacterium *Trichodesmium*. Recently the team has begun to use remote sensing techniques to study its distribution and factors affecting bloom phenomena. The group has also been investigating causes of blooms of harmful marine phytoplankton in coastal and estuarine waters.

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ROBERT M. CERRATO, Associate Professor
Ph.D. 1980, Yale University

The population and community dynamics of benthic animals are at the forefront of Robert Cerrato's research. He has been using information preserved as structural and morphological features in bivalve shells in a number of population studies. Recent work includes a study examining the relationship between shell microgrowth patterns and physiological rate processes in bivalves; studies of the population dynamics of three species (*Mya arenaria*, *Mercenaria mercenaria*, and *Spisula solidissima*); and the development of statistical approaches useful in bivalve population studies.

Cerrato and other MSRC researchers have been examining the impacts of physical disturbances on benthic community structure. In Lake Ontario, they have been examining the effects of coal, taconite, and ash deposited on the lake bottom as a result of cargo ship washing practices. On Fire Island, they are studying the effects of storms, off-road vehicle traffic, and seasonal environmental changes on the intertidal and supralittoral beach fauna.

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ROBERT D. CESS, Distinguished Professor
Ph.D. 1959, University of Pittsburgh

Robert Cess concentrates his research on two areas. One concerns theoretical and modeling studies of climate feedback mechanisms that can either amplify or diminish global climate change. A quantitative understanding of such mechanisms is a prerequisite to being able to project climate change caused by anthropogenic factors such as increasing greenhouse gases.

The second research area augments the first and concerns the acquisition and interpretation of both surface and satellite radiometric data. Thus, he has been involved with NASA's Earth Radiation Budget Experiment; their subsequent Clouds and the Earth's Radiant Energy System, which is part of the Earth Observing System; and the Department of Energy's Atmospheric Radiation Measurements Program. The focus of these observational programs is to obtain a better understanding of how clouds impact the present climate, so as to improve our capability of predicting how clouds impact climate change.

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ANDREI Y. CHISTOSERDOV, Assistant Professor
Ph.D. 1985, Institute of Genetics and Selection of Industrial Microorganisms, Moscow, Russia

Andrei Chistoserdov's broad areas of interests are marine bacteriology and metabolism of amines in nature. Amines participate in a variety of fundamental cellular processes such as mRNA translation, secretion, neural and hormonal response, tissue differentiation, oncogenesis; and, most importantly, they serve as osmolytes.

One group of bacteria, which participates in metabolism of methylated amines draws his particular attention. These are methylotrophic bacteria. On the one hand, Chistoserdov is interested in molecular and cellular mechanisms that enable these bacteria to grow on Cl compounds, and on the other hand, he is interested in understanding the role of these bacteria in the marine environment. Currently, he is extending his research to marine methylotrophs, because it is in the marine environment where methylotrophs play the most important ecological role.

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J. KIRK COCHRAN, Professor
Ph.D. 1979, Yale University

With his research group, Kirk Cochran is using natural radionuclides, as well as those produced by activities such as atomic weapons testing, to study earth surface processes. The fact that different chemical elements are represented in the suite of radioactive nuclides permits studies of chemical behavior, and the property of radioactivity provides a clock with which to measure rates. Cochran, along with Research Scientist David Hirschberg, is using naturally occurring thorium isotopes to determine rates of particle cycling in the open ocean. This work, part of the Joint Global Ocean Flux Study, has as its goal an understanding of the fate of carbon in the ocean.

Cochran is also evaluating the importance of the atmosphere as a pathway for trace metals and organic contaminants to Long Island Sound by using salt marshes as a recorder of the atmospheric inputs of metals to the estuary. His results show that most of the lead and significant amounts of copper and zinc in the sediments of the sound are supplied by the atmosphere.

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DANIEL CONLEY, Assistant Professor
Ph.D. 1993, University of California at San Diego/ Scripps Institution of Oceanography

Nearshore physical and geological oceanographic processes are at the center of Daniel Conley's work. He focuses on interactions between fluids and sediments and how such interactions control nearshore morphology. His research into such interactions occurs over spatial scales ranging from individual sand grains to entire barrier island systems. He is now working on wave- and current-driven bottom boundary layers and studying how the presence of a loose granular material affects these layers.

A recent area of investigation on the large scale concerns the dynamics of barrier island inlets. Conley is looking at how the development of new inlets affects the circulation and tidal characteristics of the back bays behind the islands and what feedback these changes provide toward the maintenance/ shoaling of the old and new inlets.

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DAVID O. CONOVER, Professor
Ph.D. 1982, University of Massachusetts

David Conover studies adaptation and natural selection of life history traits in fish. His interests include the evolution of sex ratio and sex-determining mechanisms and growth rate and body size. The empirical model for these studies is the Atlantic silverside, *Menidia menidia*. Conover maintains populations of silversides from different latitudes under controlled conditions at the Flax Pond Marine Laboratory. In addition to understanding sex ratio evolution, these laboratory populations form the basis for studies of latitudinal variation in other life history and physiological traits.

Conover also maintains an active research program in applied ecology as it pertains to fisheries science. In particular, he is investigating the life history pattern and predator-prey dynamics of bluefish, *Pomatomys saltatrix*, along the U.S. East Coast, and his studies of countergradient latitudinal variation in growth rate include fishes of importance in aquaculture such as striped bass, *Morone saxatilis*.

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NICHOLAS S. FISHER, Professor
Ph.D. 1974, State University of New York at Stony Brook

Nicholas Fisher concentrates on the interactions of metals and metalloids with marine organisms. This work is aimed at evaluating the bioavailability and fate of metals, including important long-lived radionuclides associated with nuclear wastes, in marine organisms. His group's research examines various processes regulating the uptake and trophic transfer of these contaminants in marine food webs. Thus, some of their work has explored the nature of binding of metals to diverse types of particles and the influence these have on the extent to which the metals are in a biologically available form. As a consequence, the effects of chemical and phase partitioning of metals on their bioaccumulation in marine food webs are assessed. Particle types considered include abiotic particles such as suspended sediments and living particles. As well, research has focused on the adsorption/desorption of metals to biogenic detrital matter and the influence this material can have on the vertical flux and geochemical cycling of metals in diverse oceanic regimes.

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ROGER D. FLOOD, Professor
Ph.D. 1978, Massachusetts Institute of Technology/Woods Hole Oceanographic Institution

Roger Flood is currently studying sedimentation processes and patterns in several marine and freshwater environments. He is particularly interested in the use of high-resolution methods, including geophysical techniques (side-scan sonar, seismic profiling, and high-resolution swath bathymetry), photography, submersible studies, and sediment analysis, to provide new insights into sedimentary processes. His research includes sedimentation patterns in modern environments, the structure and evolution of sedimentary bodies on the continental margin, and new methods of rapid sediment characterization.

Precise characterization of sedimentary environments is important for understanding marine and freshwater environmental problems. He has been using high-resolution geophysical techniques in studies of contamination problems in Lake Ontario and in the Hudson River (PCBs) as well as in benthic habitat surveys in Long Island's Great South Bay (hard clams).

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JANE L. FOX, Professor
Ph.D. 1978, Harvard University

The research group of Jane Fox is involved with numerical modeling of the chemical and thermal structures, luminosity, and evolution of the thermospheres-ionospheres of the Earth and planets. Recently, an important focus has been the nightside ionosphere of Venus and the ultraviolet "auroral" emissions observed there by the Pioneer Venus spacecraft. Using a combination of modeling and analysis of ion composition data from Pioneer Venus, the group hopes to elucidate the relative roles of electron impact and ion transport in producing the nightside ionosphere.

Fox is also investigating the ionospheric structure, odd nitrogen chemistry, and evolution of the Martian atmosphere. The Jovian ionosphere has also been a focus of Fox's research, especially the hydrocarbon ion chemistry, H_3^+ densities, and vibrational distributions. She has modeled the vibrational distribution of H_3^+ in order to identify the production mechanisms, and predicted the emission rates.

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MARVIN A. GELLER, Dean and Professor
Ph.D. 1969, Massachusetts Institute of Technology

Marvin Geller first became fascinated with the study of atmospheric dynamics in graduate school. Since that time, his main research has been on the dynamics of the middle atmosphere, the stratosphere and mesophere, and how these motions transport constituents such as ozone. Atmospheric wave motions play an especially important role in determining middle atmospheric dynamics and transport. They provide zonal and temporal disturbances to the steady, zonally symmetric flow, and the wave momentum deposition effects give rise to the vertical and meridional motions that determine the temperature departures from radiative equilibrium.

Geller and his group study all types of atmospheric wave motions, including tides, gravity waves, extratropical planetary waves, and equatorial waves. They also study their effects on the mean flow, including the forcing of the quasi-biennial oscillation. At present, Geller's studies include the analysis and interpretation of data from NASA's Upper Atmosphere Research Satelliteas well as from SAGE II (Stratospheric Gas and Aerosol Experiment).

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VALRIE A. GERARD, Associate Professor
Ph.D. 1976, University of California at Santa Cruz

Valrie Gerard ponders the ecology and physiology of seaweeds, particularly species that are important as structural components and primary producers in marine ecosystems or as commercial aquaculture crops. Much of Gerard's work looks at the mechanisms by which different algal species or populations adapt to stressful environments.

One ongoing project utilizes several species and ecotypes (genetically distinct populations of the same species) of the kelp, *Laminaria*, from Long Island Sound, the New England coast, and the Arctic Circle, as well as *Himantothallus*, a kelp-like Antarctic species, to examine adaptations to extreme temperature regimes.

Gerard's newest research project is aimed in a somewhat different direction—determining causes of recent local extinctions of kelp beds along the New York coast of Long Island Sound. That knowledge may allow scientists to restore and protect these important environmental resources.

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SULTAN HAMEED, Professor
Ph.D. 1968, University of Manchester

Sultan Hameed centers his research on understanding the nature and causes of climatic changes. Analysis of large-scale climatic oscillations features the analysis of multi-year simulations of climate by coupled ocean-atmosphere General Circulation Models (GCM) to identify the signatures of Southern Oscillation, the North Atlantic Oscillation, the North Pacific Oscillation, the Quasi-Biennial Oscillation, and the Chandler Wobble as natural oscillations of the system. Present work is directed at diagnosing the physical processes underlying these phenomena.

Hameed utilizes global climate models in the analysis of seasonal and interannual variation of precipitation in several regions of interest such as northeast Brazil, Sahel, and eastern China, aimed at deciphering the physical processes that contribute to climate variations in these regions and identifying additional regions where presently available global models can be useful in the study of regional climatology.

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CINDY LEE, Professor
Ph.D. 1975, University of California at San Diego/Scripps Institution of Oceanography

Examining the distribution and behavior of biogenic organic compounds in the marine environment is at the core of Cindy Lee's studies. Most biogenic organic compounds are produced in surface waters by phytoplankton as a result of photosynthesis. These compounds can enter the marine food chain by acting as food for bacteria or zooplankton. Organic compounds can also be affected by chemical and physical processes such as adsorption, photochemical degradation, and transport by currents. Lee is interested in the rates and mechanisms of the transformation reactions that occur as organic compounds are affected by these processes. To study transformation reactions, Lee and her students use radiolabeled compounds as tracers to simulate the behavior of naturally occurring compounds. They also identify and measure the amount of individual organic compounds present in the environment with analytical techniques like gas chromatography and high-performance liquid chromatography.

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DARCY J. LONSDALE, Associate Professor
Ph.D. 1979, University of Maryland

Darcy Lonsdale addresses ecological problems related to marine invertebrates, especially copepods. She has focused on measuring and understanding the significance of variations in life history and physiology among estuarine copepod populations. She has used both laboratory studies showing the genetic basis of phenotypic variation among copepod populations and field and modeling studies to illustrate the significance of life-history variation.

Lonsdale's work on life-history variation has focused on the unusual ability of fertilized female copepods to enter a "reproductive-resting" state during the late fall that would allow them to produce nauplii in early spring. Studies show that the population differences in day length necessary to trigger the stage likely reflect latitudinal variation in the period over which environmental conditions are conducive to population growth. To further evaluate the significance of this adaptation to the species' population dynamics, Lonsdale plans to conduct field studies on the temporal frequency of reproductive-resting individuals.

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GLENN R. LOPEZ, Professor
Ph.D. 1976, State University of New York at Stony Brook

Benthic ecologist Glenn Lopez is interested in many aspects of life in sediment. His primary research interest focuses on the nutrition of benthic deposit-feeding invertebrates, organisms such as bivalves and polychaetes that survive by feeding on extremely nutritionally dilute sediment. Recent work focuses on measuring availability of sedimentary organic matter to deposit feeders and characterizing digestive strategies employed to acquire food from heterogeneous organic matter in sediment. His group has marshaled a wide variety of isotopic, chemical, and microscopic techniques to study the behavior of these organisms. One current project is developing *in vivo* methods to characterize the chemical environment of guts of small invertebrates.

The group is also exploring the enigmatic nature of deep head-down deposit feeders. Lopez has collaborated with geological and physical oceanographers on the roles of physical and biological forces in the development of sediment structure.

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KAMAZIMA M.M. LWIZA, Associate Professor
Ph.D. 1990, University of Wales

Kamazima Lwiza studies the structure and dynamics of the shelf-seas and remote sensing oceanography. With colleagues from the United Kingdom, he conducted a study of the dynamics of shelf-sea fronts in the North Sea. For the study they developed a technique capable of removing the effect of tides from ship-borne acoustic Doppler current profiler (ADCP) measurements.

In 1991 Lwiza worked on a project in the North Sea to map the sea bottom topography. The researchers used a helicopter-born scatterometer to measure the sea surface roughness backscatter. The aircraft took sunglint images with an Airborne Thematic Mapper (ATM), while the ship measured physical water properties and the near-surface current modulation. Results show that accurate interpretation of radar images of sea surface roughness related to bottom topography, requires calm weather and non-stratified conditions. If the water is stratified, internal waves tend to develop and consequently phase-shift the location of the peaks of the backscattered signal.

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JOHN E. MAK, Assistant Professor
Ph.D. 1992, University of California at San Diego/ Scripps Institution of Oceanography

John Mak studies trace gases such as carbon monoxide and carbon dioxide in the earth's atmosphere to determine the sources, sinks, and chemistry of important species. He uses stable isotopes and radioisotopes to constrain relative source strengths, and to then deduce the importance of human activities on those species. To this end Mak and his students have been collecting whole air samples from a clean air site in the tropics (Ragged Point, Barbados) for subsequent analysis of trace gases. They have been specifically focusing on the isotopes of carbon monoxide. Atmospheric ^{14}CO can be used as a tracer of OH radical concentration. They have also been collecting samples from the easternmost end of Long Island to establish the seasonal cycle of the isotopes of CO and their correlation to CO_2 concentration. This will establish the magnitude of the contribution of fossil fuel combustion versus other sources during different times of the year.

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ANNE E. MC ELROY, Associate Professor
Ph.D. 1985, Massachusetts Institute of Technology/ Woods Hole Oceanographic Institution

How aquatic organisms interact with chemicals in their environment fascinates Anne McElroy. To date most of her work has focused on how benthic organisms accumulate, metabolize, and are affected by organic contaminants such as polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and, more recently, polychlorinated dibenzodioxins and furans (PCDD/Fs).

Projects underway in her laboratory include: 1) a study on bioaccumulation, metabolism, and macromolecular binding of PAH metabolites introduced through the diet to catfish; 2) a study of biochemical adaptation of killifish from populations chronically exposed to contaminated environments in the Hudson; and 3) a project investigating new methods to assess what groups of contaminants are responsible for toxicity observed in contaminated sediments from the Hudson-Raritan Estuary.

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SERGIO SAÑUDO-WILHELMY, Assistant Professor
Ph.D. 1993, University of California at Santa Cruz

The primary focus of Sergio Sañudo-Wilhelmy's research is the natural biogeochemical cycles of trace elements in the environment and the perturbations of those cycles by anthropogenic processes. He is intrigued by the dynamics of metal transport and the major processes controlling metal contamination in rivers, lakes, estuaries, coastal, and open ocean waters. In addition, he is trying to determine how natural physical oceanographic processes such as upwelling can enhance trace metal levels and cross-shelf exchange.

Sañudo-Wilhelmy's research is also oriented to chemical speciation, particularly the effect of colloids on trace metal biogeochemistry. Colloidal particles have large surface areas per unit volume, and therefore have an important effect on dissolved-particulate interactions and the transport of natural and anthropogenic chemicals in aquatic environments.

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MARY I. SCRANTON, Professor
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Woods Hole Oceanographic Institution

The factors controlling the cycling of organic compounds in sediments and in the water column are key to Mary Scranton's work. Fatty acids are important intermediates in the anaerobic decomposition of organic macromolecules, and she and her students have been focusing their efforts on understanding the processes important for these compounds.

In the CARIACO (Carbon Retention in a Colored Ocean) program, Scranton is collaborating with other scientists, including researchers from the Universidad de Oriente in Venezuela, on a study of carbon cycling in the Cariaco Basin, Venezuela. The Cariaco Basin is the largest truly marine anoxic basin in the world. Scranton's component of the study focuses on fatty acid concentrations and turnover rates to determine how bacterial activity is influenced by carbon supply and oxygen content. A second program is examining the importance of bacterial decomposition of dissolved organic carbon in the Hudson River.

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R. LAWRENCE SWANSON, Professor and Director
Ph.D. 1971, Oregon State University
Waste Reduction and Management Institute (WRMI)

Larry Swanson's major research concerns reducing the impact of waste generation on society. In the context of the ocean, this translates to understanding and identifying the appropriate use of the ocean as part of a comprehensive waste management strategy. Swanson focuses on the consequences of urban population centers and their infrastructure and waste management practices on coastal waters. Sewage, storm water, and municipal solid waste all have pronounced impacts. In some cases, short-term effects of these polluting activities have been reduced with advancing technologies; but the long-term effects are not well understood.

The development of secondary materials—materials made from post-consumer waste into new products—is a growing means of reusing waste materials. As director of WRMI, Swanson works to expand the efforts of the institute to help create cost-effective, beneficial markets for society's residues.

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GORDON T. TAYLOR, Associate Professor
Ph.D. 1983, University of Southern California

The three major areas of Gordon Taylor's research activities have focused on microbial mediation of biogeochemical process, trophic interactions among microorganisms, and microbial biofouling. He is especially interested in microbiological and chemical exchange processes at interfaces, such as particle-water and air-water.

One of Taylor's enduring research projects has been the diagenesis and microbial ecology of organic debris as it is transported from sites of production to sites of deposition. As part of the CARIACO, Taylor is trying to understand better the dynamics of carbon cycling in the Cariaco Basin of the Caribbean Sea. In a project in the lower Hudson River and western Long Island Sound estuaries, Taylor is examining seasonal changes in carbon transformations and microbial dynamics along salinity gradients. The lab has also been studying ways in which surface chemistry of inert particles determines the character of organic matter adsorbed to its surface.

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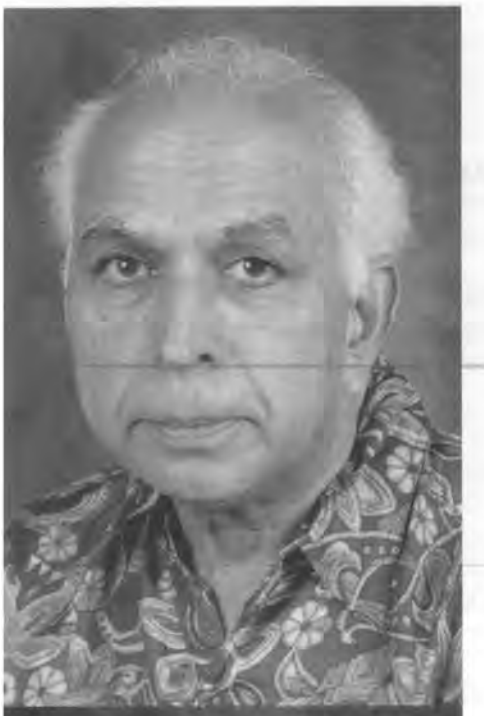

PRASAD VARANASI, Professor
Ph.D. 1967, University of California at San Diego

The research in Prasad Varansi's laboratory is related to atmospheric remote sensing, global warming, and solar system exploration. Under research support from the National Aeronautics and Space Administration and the Department of Energy, he performs infrared spectroscopic measurements on molecular constituents of the terrestrial and planetary atmospheres.

One of the pivotal research problems associated with global warming, especially in connection with the water vapor feedback mechanism, is the enigmatic water vapor continuum, of which Varansi was a co-discoverer as a Ph.D. student at the University of California at San Diego in 1966.

Varansi's laboratory houses one of the world's finest commercial Fourier transform spectrometers, a tunable diode laser spectrometer, and several cryogenically coolable absorption cells (sample chambers) of his lab's unique and original design.

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DUANE E. WALISER, Assistant Professor
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Duane Waliser's research emphasizes observational and theoretical aspects of ocean-atmosphere coupling in the tropics. This has included large-scale aspects, such as the latitude preference of the Intertropical Convergence Zone, the regulation of tropical sea surface temperatures, and the covariability of the tropical Hadley and Walker circulations, as well as small-scale interactions, such as near-surface heat, moisture, and radiation exchange associated with tropical cloud systems.

Waliser is presently undertaking studies on intraseasonal variability in the tropics, namely on phenomena known as Madden-Julian Oscillations. These are large-scale atmospheric disturbances that move slowly eastward from the Indian to the Pacific Ocean. They can have significant impacts on local precipitation variability, the onset and breaks of the Australian-Asian monsoons, the variability of the equatorial Pacific thermocline, as well as influence some aspects of extratropical weather.

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DONG-PING WANG, Professor
Ph.D. 1975, University of Miami

Dong-Ping Wang focuses on modeling and analysis of physical processes in estuaries and over continental shelves and slopes. He and his students are studying internal tides in the Gibraltar Strait, in the Gulf of California, and on the Celtic Sea slope. They are also investigating the generation of mesoscale inertial variability on the continental shelf off northeast Spain.

In addition to coastal process studies, his lab is collaborating with the Applied Mathematics and Statistics Department at Stony Brook on massive parallel computing. Their long-term goal is to take advantage of the recent development in supercomputing to solve large-scale coastal ocean problems. Wang is also working with the Naval Undersea System Center (NUSC) to explore the feasibility of predicting the acoustic variability in the coastal ocean. They plan to interface the NUSC acoustic model with Wang's general circulation model to study shallow-water acoustics.

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ROBERT E. WILSON, Associate Professor
Ph.D. 1974, The Johns Hopkins University

Robert Wilson's interests relate to the transport processes in estuaries. They include specifically the description of time-dependent mixing processes in partially stratified estuaries, tidally induced residual currents in estuarine basins, and the interaction of buoyancy-forced and tidally induced residual currents in estuaries.

Wilson is interested in internal hydraulics, in the assimilation of data into models for estuarine circulation, and in the analysis of long-term data sets to evaluate effects of climatic variability on coastal hydrography.

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JEANNETTE YEN, Associate Professor
Ph.D. 1982, University of Washington

Jeannette Yen's research interests include: feeding ecology, functional morphology and behavior, sensory perception of fluid motion and neurophysiology, lipid biochemistry, and reproductive ecology of marine plankton, specifically copepods. She has done a comparative study of feeding, physiology, and behavior of four species of the carnivorous marine copepod *Euchaeta*. These copepods are biomass dominants in latitudinally separate oceanic regions: Antarctic, subarctic, temperate, and subtropic. With her present studies of small-scale biological-physical interactions in the plankton, she wishes to identify the signals created by escaping prey, lunging predators, and attractive mates. This study of remote sensory perception by 1-10 mm–long zooplankters involves an understanding of fluid physics at low Reynold's numbers; the transmission of signals through the water at small temporal and spatial scales in three dimensions; and the behavioral recognition by plankton of these cues.

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MINGHUA ZHANG, Associate Professor
Ph.D. 1987, Institute of Atmospheric Physics, Academia Sinica

Numerical modeling of climate and climate change is one area of interest for Minghua Zhang. The earth's climate system is composed of the atmosphere, the hydrosphere, the biosphere, and the lithosphere. Complicated interactions exist among these components and between various physical and dynamical processes inside them.

To quantitatively study why the earth's climate changed in the past and how it will change in the future, for example, in response to the increasing concentration of carbon dioxide in the atmosphere, Zhang incorporates these components and the important processes, such as atmospheric circulation, clouds, radiation, precipitation, and ocean currents, in numerical models based on physical principles or empirically obtained relationships. He uses these climate models to study the interactive feedback in the climate system and to validate the current model treatments of physical processes against satellite and other observations.

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Joint Faculty Profiles

As the field of Marine Science incorporates many other disciplines, the faculty include professors from other departments, such as Physics, Chemistry, and Ecology and Evolution. These joint appointments give students access to the top researchers in a variety of fields.

EDWARD BELTRAMI, Professor
Ph.D. 1962, Adelphi University
Department of Applied Mathematics

Edward Beltrami's career has spanned a number of research areas, from theoretical work in operator theory and mathematical programming to more applications-oriented research in network optimization, stochastic processes, and differential equations. Much of this work has been in connection with models of urban and public sector operations and, most recently, with dynamical models in biomathematics, especially marine ecosystems.

His previous work has included the use of simple and transparent mathematical models to assess the impact of abatement schemes on coastal pollutions from runoff and wastewater disposal, and to estimate the susceptibility of coastal waters to eutrophication. Concurrent with this is Beltrami's interest in the dynamics of harmful algal blooms in coastal waters, using mathematical models to determine thresholds that trigger and sustain these explosive growths of cells which have serious health and economic consequences.

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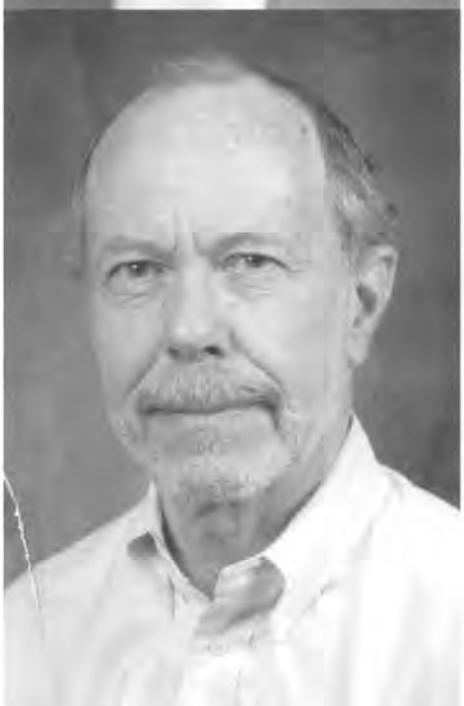

ROBERT L. DE ZAFRA, Professor
Ph.D. 1958, University of Maryland
Department of Physics

Physicist Robert de Zafra has been concerned for well over a decade with developing and applying accurate methods for making remote measurements of stratospheric trace gases that are involved in ozone deletion chemistry and the thermodynamics of the stratosphere. He and his colleagues have developed a unique ground-based remote sensing spectrometer, able to identify and quantitatively measure molecular rotational emission spectra from stratospheric trace gases present in as little as a few tenths of a part per billion of ambient air pressure. With this technique, de Zafra has been monitoring the destructive effects of chlorofluorocarbons on stratospheric ozone since 1981. In 1986, he obtained the first proof, from data collected in Antarctica, that the seasonal "Ozone Hole" discovered over that continent was caused by chlorine from chlorofluorocarbons. Since then, his group has returned frequently to Antarctica and the Arctic to make further measurements of stratospheric chemistry.

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THEODORE D. GOLDFARB, Professor
Ph.D. 1959, University of California at Berkeley
Department of Chemistry

In recent years Theodore Goldfarb's research interests have shifted from physical-chemical investigations of the structure and reactivity of molecules to applications of physical chemical methods, to real world environmental problems. The pollution problems resulting from the use of agricultural chemicals, the production of energy, and the disposal of waste encompass the range of issues that he has joined with scientists in other disciplines to explore. Their present activities are focused on the environmental consequences of alternative means of addressing the need to dispose of both municipal and industrial waste, including incineration, waste reduction, reuse, and recycling. Related to this work is his interest in the interactions between science and public policy, and ethics in science.

(516) 632-7908, tgoldfarb@sprynet.com

WILLIAM H. GREENE, M.D., Associate Professor
M.D. 1968, State University of New York Downstate Medical Center
University Hospital Epidemiology Department, School of Medicine

William Greene was a clinical associate and received fellowship training in infectious diseases and medical oncology at the Baltimore Cancer Research Center of the National Cancer Institute and subsequent training in infectious diseases and immunology at Yale. He was then on the faculty at Yale before coming to Stony Brook to direct the University Hospital Epidemiology Department. He has had an abiding interest in clinical epidemiology of nosocomial infections and in the prevention and treatment of such infections using investigational agents in clinical trials. Current clinical studies involve the treatment of intra-abdominal sepsis and of vancomycin-resistant enterococci. He also recently became director of the hospital program for Quality Management and will be involved with an associated health services research initiative. He has served as a consultant to the New York State Department of Health on infection control education as well.

(516) 444-1660, William.Greene@sunysb.edu

STEWART HARRIS, Professor
Ph.D. 1965, Northwestern University
College of Engineering and Applied Sciences

Stewart Harris's research interests cover topics in which diffusion plays a central role. These include phenomena occurring over very large spatial distances, as with the movement of methane in sanitary landfills; intermediate distances, as with the diffusion of particulate through the human respiratory system; and down to the atomic level, as with the diffusion of individual atoms during the fabrication of tailored materials for use in microelectronic applications. Harris is the author of a book on the theory of the Boltzmann equation, as well as over 75 scientific articles. During the 11 years he served as dean of the College of Engineering and Applied Sciences at Stony Brook he was a frequent speaker at meetings and conferences dealing with issues related to technology development.

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HERBERT HERMAN, Professor
Ph.D. 1961, Northwestern University
Department of Materials Science and Engineering

Herbert Herman's research activities in ocean engineering involve principally marine materials. His lab has a long-term program under way aimed at the protection of materials at sea. The group's work, much of which is supported by the U.S. Navy, involves the thermal spray metallization of structural steel, yielding long-term corrosion protection in a wide range of industrial and marine environments.

Herman is also involved with a joint program with the Port Authority of New York and New Jersey on corrosion protection of marine-related structures. Research and testing programs, with use of the above and related corrosion control techniques, are being carried out cooperatively with industrial and government organizations.

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L. E. KOPPELMAN, Professor
Ph.D. 1970, New York University
Center for Regional Policy Studies

Over the past decade and a half, L.E. Koppelman's major research has been concerned with the environmental policy aspects of regional planning and has been specifically directed toward coastal zone management. This has included being project manager over almost $20 million in directed research, including coastal regional planning, comprehensive water management, shoreline erosion practices, and related studies.

In addition to the development of legislation related to coastal zone management and the design of administrative mechanisms for policy implementation, Koppelman is particularly involved in the development of synthesis techniques for relating coastal zone science into the regional planning process. In 1988 Koppelman was appointed director of the Center for Regional Policy Studies, which is carrying out a number of research projects dealing with governmental productivity and environmental planning.

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MANUEL LERDAU, Assistant Professor
Ph.D. 1992, Stanford University
Department of Ecology and Evolution

Manuel Lerdau's research focuses on how plant physiological processes affect resource acquisition and allocation at the level of individual plants and the influence of these allocation patterns on the exchange of materials between the biosphere and the atmosphere. Plant emissions of hydrocarbons are the major source of reduced compounds in the atmosphere, and Lerdau's research concentrates on the biological bases for these emissions. Through simulation modeling and empirical studies, he is examining how plant responses to ecological parameters affect the chemistry of the lower atmosphere.

Lerdau's biosphere-atmosphere exchange research examines the controls over hydrocarbon emissions from conifers and the development of ecosystem models of hydrocarbon emissions. He is extending this work to include both a greater variety of plant taxa and the effects of herbivores. He has continuing interest in the ecology of tropical plants and in the development of plant resource allocation models.

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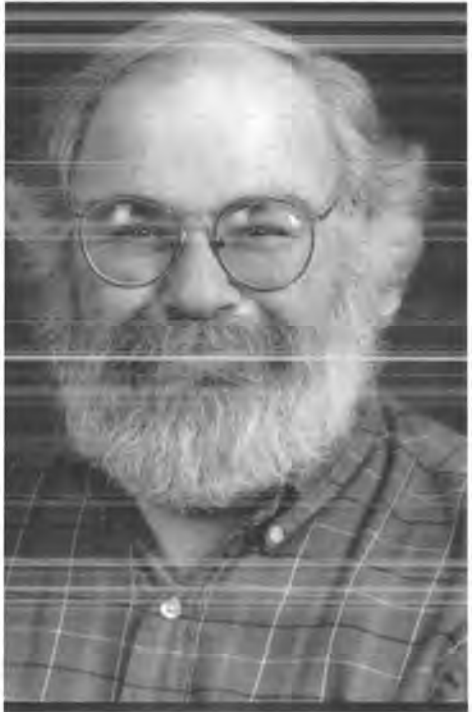

JEFFREY LEVINTON, Professor
Ph.D. 1971, Yale University
Department of Ecology and Evolution

Marine ecologist Jeff Levinton is concerned with the feeding ecology of marine invertebrates and how this influences population levels in marine benthic communities. His research is focused on the feeding processes of suspension- and deposit-feeding bivalves. One aspect of this research employs fiber optic videomicroscopy to view how particles are collected and handled by gills and palps of several bivalve species. Equally important is his study of combat and display structures and their evolution, with a special focus on sexual claw dimorphism in crabs. This work is an attempt to understand how the evolution of a combat structure by sexual selection influences behavioral evolution. With other Ecology and Evolution professors, he is working on a project designed to estimate the time of divergence of the animal phyla using molecular divergence and fossil divergence data.

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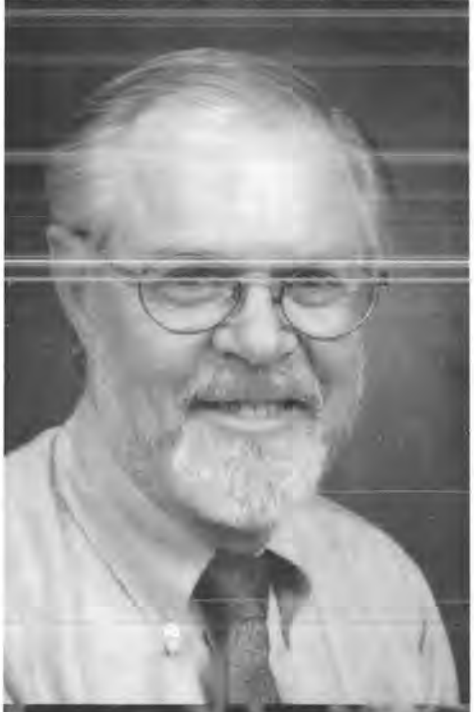

JACK S. MATTICE, Director
Ph.D. 1971, Syracuse University
New York Sea Grant Institute

Both as a researcher and research manager, Jack Mattice's primary interests have focused on the interface of energy development and environmental protection. Specific topics have included: individual and population responses of benthos to both intermittent and chronic thermal regimes; effects of chemical speciation on response to toxicants; and density dependent and independent population responses of fishes exposed to lake or stream acidification, hydropower operation, and cooling water intakes. In each case, the goal has been to provide a sound scientific basis for decisions about resource use. The New York Sea Grant Institute is a partnership of the State University of New York and Cornell, with the National Sea Grant College Program of the National Oceanic and Atmospheric Administration. NYSG sponsors research, educational, and extension activities aimed at sustainable development of marine and Great Lakes coastal resources.

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W. J. MEYERS, Professor
Ph.D. 1973, Rice University
Department of Earth and Space Sciences

The nucleus of W. J. Meyer's research is the deposition and diagenesis of carbonate rocks and sediments. Through integrated field, petrographic, and geochemical studies, he and his students are investigating regional dolomitization, cementation, and compaction in a wide range of shallow-water reefal, platform, and peri-platform carbonate rocks from a range of ages and tectonosedimentary settings. The main goals are to reconstruct the diagenetic histories of the rocks and to reconstruct the chemistry, sources, and dynamics of the diagenetic fluids that caused large-scale cementation and dolomitization. To this end they are applying standard and cathodoluminescent petrography, fluid inclusion studies, stable and radiogenic isotopes; trace elements; and quantitative water-rock interaction modeling. The geochemical work has resulted in the development of innovative analytical and modeling approaches to studying diagenetic carbonates.

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SHELDON REAVEN, Associate Professor
Ph.D. 1975, University of California at Berkeley
Department of Technology and Society

Sheldon Reaven has been working mostly in two areas of waste management: what to do with garbage, especially plastics, and what to do with nuclear wastes. His approach to these problems might be called "technology assessment." This means working on problems from both the scientific and the ethical and policy ends. His research indicates that all of the complex environmental problems faced today are characterized by thoroughgoing scientific and nonscientific disagreement, and he has tried to help both scientists and lay citizens untangle the web of conflicting evidence and argumentation surrounding these problems.

Current research projects include a study of the breakdown and environmental impacts of degradable plastics in landfills, seawater, and other environments; and a study of the energy impacts of recycled plastic "lumber" and construction blocks made from incinerator ash.

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LAWRENCE B. SLOBODKIN, Professor
Ph.D. 1951, Yale University
Department of Ecology and Evolution

Professor Slobodkin, the founder of the Department of Ecology and Evolution, is engaged in a long-term research project on *Hydra*. The simplicity of this animal has permitted the development of a theoretical model in which ecological and evolutionary properties can be predicted from physiological assumptions. He plans to test these predictions in the field by examining *Hydra* and zooplankton from Swan Pond, with special focus on seasonal emergence patterns and the role of animal seedbanks. He is also studying current problems of ecological policy development and preparing a book on applied ecology.

Professor Slobodkin is a member of the American Academy of Arts and Sciences, and has been the president of several learned societies, including the American Society of Naturalists. He is well known for his many contributions to ecology, but his work on the energetics of laboratory populations and his famous text on animal population biology are two accomplishments of special note.

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Adjunct Faculty Profiles

The adjunct faculty offer students a unique perspective on their areas of expertise. In addition to teaching courses at the MSRC, these professionals maintain careers outside the University. Their presence in the department gives students a well-rounded picture of the work available in the marine and atmospheric science fields.

ADRIA A. ELSKUS, Assistant Professor
Ph.D. 1992, Boston University Marine Program

Adria Elskus is interested in the response of organisms to aquatic pollutants. Her research concerns the metabolic fate and effects of contaminants in fish and invertebrates, the hormonal and xenobiotic regulation of this metabolism, and the mechanisms underlying the development of contaminant resistance by populations generationally exposed to pollutants.

A current project examines the metabolic consequences of suppressing the activity of CYP1A, an enzyme responsible for metabolizing organic toxicants. CYP1A suppression is observed in two situations: in spawning female fish where estradiol downregulates CYP1A; and in populations chronically exposed to high levels of organic pollutants where CYP1A is suppressed by an as yet unknown mechanism. A second project concerns contaminated sediments in New York Harbor. Elskus and her collaborators are evaluating the ecosystem response by comparing the relative sensitivity of species from different trophic levels to toxic sediments.

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SENJIE LIN, Assistant Professor
Ph.D. 1995, State University of New York at Stony Brook

Senjie Lin plans to establish and apply molecular approaches to study the physiology and ecology of plankton. His research focuses on two areas: analyses of the biochemical control elements of the cell division cycle, and use of these elements as markers to investigate the species-specific growth rate of phytoplankton. Along this line, he is trying to establish a useful approach to study the dynamics and causes of harmful algal blooms such as red tides and brown tide. The second area concerns ecological responses of phytoplankton to varying physical and chemical conditions using immunocytochemical techniques. In this area, Lin is particularly interested in studying proteins or enzymes responsible for important biological processes, stress responses, and damage repair. His goal is to establish a quantitative method to assess the extent of the ecological responses and stresses.

In addition, Lin is engaged in using molecular approaches to study zooplankton transport, growth, and development.

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FRANK J. ROETHEL, Lecturer
Ph.D. 1982, State University of New York at Stony Brook

The research group of Frank Roethel investigates environmental issues associated with combustion by-products, including ash from the incineration of garbage and trash. His group is examining a diverse array of environmental issues in both marine and terrestrial systems including leaching behavior, particulate exposure pathways, and beneficial utilization strategies.

These investigations have resulted in the construction of the first artificial reef in the coastal waters of the United States fabricated from blocks of stabilized incineration ash. In addition, to evaluate the potential for using combustion by-products in construction applications, a boathouse was built on campus using incineration ash as an aggregate substitute. This novel recycling option has taken Roethel's students to diverse locations, such as salt mines, where investigations focusing on the use of waste products in mine closure applications are being assessed, and Italy, where solid waste management strategies are now being developed.

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PETER M.J. WOODHEAD, Professor
B.Sc. Hon. 1 Cl. 1953, Durham University, England

Peter Woodhead has long-standing interests in fishes and fisheries in many waters. He studies migrations and movements of fishes in relation to their internal, endocrine, and external physical environment. Hydro-acoustic methods are used to make quantitative assessments of fish abundance and behavior. Recent research has taken place in the Barents Sea, North Sea, and the Benguela upwelling system.

In local waters, Woodhead has focused on fish communities inhabiting the estuary system of the Hudson River, New York Harbor, Long Island Sound, and the New York bight—their composition, distribution, and changes in space and time. The local estuaries and nearshore waters, which are being studied, are often very contaminated and stressed. Summertime hypoxia is common. Pollution has pronounced effects on behavior and abundance distributions of fish and benthic invertebrate populations. The influences of natural climate changes on fish populations of the northeast region are also of great interest.

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VALERY YUDIN, Assistant Professor
Ph.D. 1986, State University of St. Petersburg, Russia
Department of Atmospheric Physics

Valery Yudin focuses his research on the dynamics and chemistry of the middle and upper atmosphere. Yudin has been closely involved with NASA-supported research on the Upper Atmosphere Research Satellite (UARS) data. The UARS program is key to understanding both global changes in the stratospheric ozone layer and global wave dynamics in the mesosphere and lower thermosphere. For the interpretation of ground-based and satellite data, Yudin employs dynamical and photochemical numerical models to understand the coupling between lower and upper atmosphere.

Currently, Yudin is conducting research on a new methodology called Data Assimilation in the Middle and Upper Atmosphere. This is an area of atmospheric data analysis that has been applied to UARS data, and will be crucial in analyzing the wind, temperature, and airglow data to be obtained by future satellite missions for investigation of the upper atmosphere.

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Perspectives

Lisa Clough on one of her journeys to the North Pole.

Lisa Clough, Assistant Professor,
Department of Biology, East Carolina University

Oceanography is by definition interdisciplinary; yet educating students in an interdisciplinary field presents some interesting challenges. During my MSRC years I vaguely remember being frustrated by all we had to know, then progressing to thinking I had all the answers, and finally hitting the point where I realized I had none of the answers, but was beginning to see how connections between the different fields could be made, and how exciting such interdisciplinary work was! Of course I also realized that I'd never be the geochemist that Bob Aller is, nor the ecologist that Glenn Lopez is, but maybe I could find a niche somewhere in between. The degree of collaboration between faculty, and the level of respect and camaraderie afforded graduate students by the faculty is what made my project possible, and what makes the MSRC environment truly unique.

Since leaving the MSRC, I've become an actual seagoing oceanographer, and I appreciate my multidisciplinary training all the more. My journeys have taken me to the Arctic Ocean four times in the last six years. Because graduate students are encouraged to do things like give the informal Friday afternoon seminar, I felt very well prepared to present my ideas to colleagues, and to face the challenges of teaching at the college level. My training at the MSRC, and the support network that is in place among and between graduate students, faculty, and staff has allowed me to wind up in a job that I truly enjoy going to (almost) every morning!

Doctoral Student Tom Hurst

When I came to the MSRC to study the population biology of fishes, I was impressed by the breadth of topics addressed by the faculty. However, I couldn't predict how valuable this diversity of interests would become to me. During the course of my research on the winter ecology of striped bass, I have frequently called upon the expertise of geologists, benthic ecologists, and physical oceanographers in planning experiments and interpreting findings. In addition I have had the opportunity to participate in a variety of estuarine research projects outside of my own work. Through this cooperation, I have gained a much better understanding of my study organism, and the estuarine environment in which it lives. Working among such a diverse group of scientists has been an incredibly challenging experience, and one which has been invaluable to my professional development.

Silvio Pantoja, Department of Marine Chemistry
and Geochemistry, Woods Hole Oceanographic Institution

I am presently a post-doctoral scholar at Woods Hole Oceanographic Institution. My current research focuses on several aspects of the nitrogen cycle, for which I am studying the isotopic signal of nitrogen in organic molecules. This work has recently taken me on a collaborative scientific cruise with French scientists in the Mediterranean Sea.

"The level of respect and camaraderie afforded graduate students by the faculty is what makes the MSRC environment truly unique."

I think that the comprehensive training I obtained at Stony Brook has been crucial in the shaping of my career within the multidisciplinary character of modern oceanography. The center brings together a number of leading researchers with a diverse range of interests, who have also created strong research ties and collaborate on projects on a regular basis. This feature of the department can be particularly appealing to graduate students, who can benefit from this scientific interaction to explore their interests from different angles. In addition, graduate students at the center can profit from the approachability and willingness to discuss new ideas that characterizes the faculty at the MSRC.

Doctoral Student Anitra Ingalls

I highly recommend Stony Brook and the Marine Sciences Research Center to prospective students. The faculty here are not only first-rate researchers; they sincerely care about seeing graduate students achieve their career goals in science. Students come to the MSRC from a variety of backgrounds and with a broad range of interests. This diversity is one of the MSRC's greatest strengths. Students can pursue their interests in all areas of oceanographic research, and have the opportunity to participate in and design projects in locations ranging from the Long Island Sound to the Atlantic Ocean. Living near the water is an added plus. While some students rely on the sound as a study site, others are happy to go kayaking, swimming, sailing, and fishing there when they are not in the lab.

Spotlight on Alumni

Current Positions Held by Selected Program Alumni (Ph.D. unless noted)

1982 Vincent Breslin (M.S.), Assistant Professor, Marine Sciences Research Center, SUNY at Stony Brook.
Jeffrey Kassner (M.S.), Director of Environmental Protection, Town of Brookhaven, Division of Environmental Protection.
Brian Sanderson, Senior Lecturer, School of Mathematics, University of New South Wales, Sydney, Australia.

1983 Edward Ambrogio (M.S.), U.S. Environmental Protection Agency, Philadelphia.
James Bauer (M.S.), Associate Professor, Virginia Institute of Marine Sciences.
Cornelia Schlenk (M.S.), Associate Director, New York Sea Grant Institute, Stony Brook, NY.

1984 V. Monica Bricelj, Senior Scientist, National Research Council, Halifax, Canada.
Thomas Gulbransen (M.S.), Regional Manager, Battelle Corporation, Nesconset, NY.

1985 Lisa Campbell, Associate Professor, Department of Oceanography, Texas A&M University, College Station, TX.
Gene Feldman, Data System Manager, Goddard Space Flight Center, Greenbelt, MD.
Vladimir Koutitonsky, Director, INRS-Océanologie, University of Quebec, Rimouski, Canada.
Gregg Rivera (M.S.), Cornell Cooperative Extension–Suffolk, Southold, NY.

1986 George McManus, Associate Professor, Department of Marine Sciences, University of Connecticut.

1987 Melissa Beristain (M.S.), Westchester County Planning Department.
Ronald Kiene, Associate Professor, University of South Alabama, Mobile, AL.
Bernice Malione (M.S.), New York Port Authority.

1988 I-Jiunn Cheng, Associate Professor, Taiwan National Ocean University.
Louis Chiarella (M.S.), New York Department of Environmental Conservation.
Valery Forbes, Associate Professor, Roskilde University, Roskilde, Denmark.

1989 Hans Dam, Associate Professor, Department of Marine Sciences, University of Connecticut.
Tom Forbes, Research Scientist, National Environmental Research Institute, Roskilde, Denmark.
Xiao-hai Yan, Associate Professor, College of Marine Studies, University of Delaware.

1990 In-Young Ahn, Research Scientist, Korea Ocean Research and Development Institute, Seoul, Korea.
Dake Chen, Research Scientist, Lamont Doherty Earth Observatory, Palisades, NY.
Moon-Jin Park, Associate Professor, Department of Oceanography, Chugnam National University, Korea.
Pitiwong Tantichodok, Associate Professor, Prince of Songkla University, Hat Yai, Thailand.

1991 Eric Hince (M.S.), Geovation Consultants, Harriman, NY.
Peter Rude, Landau Associates, Seattle, WA.
Lita Proctor, Assistant Professor, Florida State University, Tallahassee, FL.

1992 Francis Juanes, Assistant Professor, University of Massachusetts, Amherst, MA.
Andrew Parrella (M.S.), Environmental Systems and Technology, Duxbury, MA.
Ming-Yi Sun, Assistant Professor, Department of Marine Sciences, University of Georgia, Athens, GA.
Arnoldo Valle-Levinson, Assistant Professor, Department of Ocean, Earth, and Atmospheric Sciences, Old Dominion University, Norfolk, VA.
Meng Zhou, Research Scientist, Scripps Institution of Oceanography, La Jolla, CA.

1993 Mead Allison, Assistant Professor, Texas A&M at Galveston.
Lisa Clough, Assistant Professor, East Carolina University, Greenville, NC.
Byeong-Gweon Lee, Research Associate, U.S. Geological Survey, Menlo Park, CA.
John Reinfelder, Assistant Professor, Department of Environmental Sciences, Rutgers University, NJ.

1994 Jon Hare, Research Scientist, Southeast Fisheries Sciences Center, Beaufort, NC.
Susan Sponaugle, Research Scientist, Rosenstiel School of Marine Sciences, University of Miami, FL.

1995 Ajit Subramaniam, Post-doctoral Researcher, Chesapeake Biological Laboratory, University of Maryland, Solomons, MD.
Kate Stansfield, Post-doctoral Fellow, School for Earth and Ocean Sciences, University of Victoria, Canada.

1996 Mark Green, Assistant Professor, St. Joseph's College, Standish, ME.
William G. Wallace, National Research Council Associate, U.S. Geological Survey, Menlo Park, CA.
Wen-Xiong Wang, Assistant Professor, Department of Biology, Hong Kong University of Science and Technology.

1997 Jeffrey Buckel, Post-doctoral Fellow, National Marine Fisheries Center, Sandy Hook, NJ.
Chi-Shao Chen, Professor, Taiwan Naval Academy.
Sidney Fauria, Associate Vice President, Dillard University.
Huan Feng, Research Associate, Brookhaven National Laboratory, Upton, NY.

1998 Samuel Bentley, National Research Council Associate, Naval Research Laboratory, Stennis Space Center, MS.
Nancy Craig, Knaus Fellow, NOAA, Coastal Oceans Program, Silver Springs, MD.
Silvio Pantoja, Post-doctoral Fellow, Woods Hole Oceanographic Institution, Woods Hole, MA.

Living in Stony Brook

The University is located in one of the East Coast's most desirable spots—the North Shore of Long Island, about 60 miles east of New York City (midway between Montauk and Manhattan). The tranquil waters of Long Island Sound are just minutes away to the north, and the white sandy beaches of the Atlantic Ocean beckon southward.

North of the University, within easy bicycling distance, lies the historic village of Stony Brook. Its quaint shopping area was created by Ward Melville, heir to the Thom McAn shoe fortune. (Ward and his wife, Dorothy, donated the land where the campus now stands.) One of the best ways to experience Stony Brook village is to pick up an ice cream cone from the Brook House luncheonette, sit on the village green, and enjoy an unobstructed view of the sunset. Across the street is the landmark Three Village Inn, dating back to pre-Revolutionary days. The Stony Brook Grist Mill, built in 1751, is a working mill open to the public for tours. The Mill Pond across the street (a perfect place to stroll and feed the ducks) is fed by the original "stony brook"; the Setalcott Indians called this stream *Cutsgunsuck*, or "brook laden with small stones."

Students enjoy lunch and conversation outside the new Student Activities Center.

Historic Surroundings

During the American Revolution, the entire Three Village area—though officially Loyalist territory—was a hotbed of colonial spy activity. One Setauket lady devised a code to signal patriots waiting to learn if the coast was clear: she hung different color combinations of laundry to communicate top-secret messages. And it's said that the Country House restaurant, which started life as a private residence and today serves modern-day diners, houses a ghost who still thumps across the floor of her second-story room.

Cultural Diversity

Culture abounds on Long Island. Although Manhattan is only a train ride away, theatre lovers need travel no further than the Staller Center for the Arts. Located on the Stony Brook campus, the Staller Center presents hundreds of plays, concerts, and special events each year. It houses the 1,100-seat Main Stage Theatre, a 400-seat recital hall, three experimental "black box" theatres, and a 4,700-square-foot art gallery. Staller's summer film festival is recognized as a "mini-Sundance." Live theatre is also offered in nearby Port Jefferson (ten minutes away); the village's Theatre Three offers performances of Broadway and off-Broadway shows, and acting classes. The theatre building itself, a former vaudeville palace, dates back to the 1800s. In Stony Brook village, the Museums at Stony Brook are a must for art and history lovers. The complex of historic buildings houses one of the world's largest collections of horse-drawn carriages, and the paintings of William Sidney Mount, a Stony Brook native who became the nation's first famous "genre" painter. Local cafes and bookstores make Stony Brook a good place to browse.

The village of Huntington offers the Cinema Arts Center, where one can view the latest "indie" films. In recent years Long Island has developed a reputation for its blues music scene, but a growing number of coffeehouses present other types of music as well; folk, bluegrass, and jazz are just a few of the styles you'll find.

For sports and fitness enthusiasts, the University has a 5,000-seat indoor Sports Complex complete with running track, weight rooms, raquetball and basketball courts, and a pool. Plans are underway for the construction of an outdoor stadium for sporting events and concerts. The Student Activities Center houses the Eugene Weidman Wellness Center, which offers fitness classes in everything from aerobics to yoga, and state-of-the-art exercise equipment. If professional

Situated between Manhattan and Montauk, Stony Brook offers the best of both worlds. Our central location provides students with access to a variety of shopping areas, historical landmarks, beautiful parks and beaches, and Broadway-quality entertainment at the Staller Center on campus.

sports are your thing, Long Island has its own Stanley Cup champion New York Islanders ice hockey team. The excitement of Madison Square Garden, Yankee Stadium, and Shea Stadium (home of the New York Mets) is only 60 miles away.

Long Island is heaven for "foodies"; just about every cuisine you might think of—Afghani, Thai, Indian, etc.—can be sampled here (along with a liberal sprinkling of seafood shacks). The region's growing reputation as a producer of excellent wines makes for a pleasant day's tour of Long Island wineries.

For those who like to "shop till they drop," Long Island does not disappoint. It's home to Roosevelt Field, once the starting place for Charles Lindbergh's famous solo flight and now a nationally known shopping mall. Long Island offers every type of store, from the nation's first supermarket (King Kullen) to retail outlets.

Nature's Bounty

Long Island is rich in wild landscapes. The campus is close to the Fire Island National Seashore. To the east lies the unique ecosystem of the pine barrens, where The Nature Conservancy maintains a number of hiking trails and nature preserves. And of course, the area's miles of seacoast make it paradise for boaters, anglers, and windsurfers. In fact, the campus is surrounded by Long Island maritime heritage. Port Jefferson (originally called "Drowned Meadow"), Setauket, and Stony Brook itself were once bustling shipbuilding centers; today the ferry that links Port Jeff to Bridgeport, Connecticut, makes the Three Village area a convenient jumping-off point for trips to New England.

Life at Stony Brook has something for everyone. There is the tranquil pace of the surrounding community, which has managed to preserve an old-fashioned, small-town atmosphere. At the same time, there are the cutting-edge resources and the abundant culture of the University itself.

At Stony Brook, we believe diversity is an integral component of the intellectual experience. Since 32 percent of our graduate enrollees are African American, Latino, Native American and international students, our University is a place where cultures converge.

From quaint flower shops to the popular Three Village Inn, Stony Brook village provides hours of shopping as well as dozens of dining possibilities.

Application and Admission

Application Materials and Deadlines

Application forms can be obtained by calling the Marine Sciences Research Center office at (516) 632-8681; by writing to the Director of Graduate Studies (Marine Sciences Research Center, State University at Stony Brook, Stony Brook, NY 11794-5000, USA); or from our Web page at *http://www.msrc.sunysb.edu*.

Besides completing this form, applicants will need to provide (1) official transcripts of undergraduate and (if applicable) graduate coursework; (2) official Graduate Record Examination (GRE) scores (Stony Brook's code for score reporting is 2548); (3) an acceptable score (600) on TOEFL for foreign students; (4) three letters of recommendation; and (5) a nonrefundable $50.00 fee.

Send your application directly to us at: Marine Sciences Research Center, State University at Stony Brook, Stony Brook, NY 11794-5000, USA. The deadline for receipt of all application materials is February 1. Earlier submissions are encouraged, particularly for those wishing to be considered in the campus-wide competition for Graduate Council Fellowships (see right). Funding cannot be guaranteed to successful applicants whose materials arrive after the deadline. Prospective students are encouraged to address specific questions to the Director of Graduate Studies at the above address, or to contact faculty members whose work they find interesting.

Admission

Applicants to the M.S. program in Marine Environmental Sciences should have accomplished some coursework in mathematics through calculus, physics, and introductory courses in at least two of the following areas: chemistry, biology, and earth sciences. Applicants with especially strong academic records may apply directly to the Ph.D. program in Coastal Oceanography; otherwise, applicants should have an M.S. degree in an appropriate scientific discipline. Students may be admitted to the Ph.D. program upon completion of the Marine Environmental Sciences program, or by transfer from other institutions. The M.S. requirement may be waived for students at the MSRC who have demonstrated exceptional capabilities in scholarship and motivation.

Roth Pond is just one of the many scenic spots on campus.

Financial Support and Benefits

Graduate traineeships (teaching assistantships, graduate assistantships) are awarded on a competitive basis by the Graduate School on recommendation of the program for one year, and may be renewed for up to four years. Current stipends for the academic year (9 months) are approximately $9,847. Most graduate students at the MSRC receive research assistantships between $15,000 and $20,000 for 12 months.

The MSRC has a variety of special awards available to graduate students. The William E. Simon Minority Fellowship Program assists academically qualified minority students in obtaining a graduate education at the Marine Sciences Research Center. Fellows must be U.S. citizens or permanent residents. The fellowship is funded by interest from the grant and is intended to supplement, not replace, aid provided by the University and the MSRC. No preset amount is specified for the fellowships, but previous recipients have received up to $4,000 a year.

The Evan R. Liblit Award is granted to a student in the Waste Reduction and Management Institute. The recipient receives a full tuition scholarship plus a stipend. Several awards are also presented to first-year students.

The University offers several scholarship programs to graduate students. These fellowships are awarded on the basis of merit. Graduate Council Fellowships are awarded to exceptional entering graduate students who are U.S. citizens. They provide five years of stipend support. W. Burghart Turner Fellowships are awarded to outstanding incoming graduate students of Hispanic, African American, or Native American descent. They provide a stipend for two years.

Extramural Financial Support

Several government agencies and national foundations offer fellowships to support graduate students, including the National Science Foundation (NSF), Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), the Howard Hughes Foundation, the Brookhaven National Laboratory, and the Sea Grant Institute. Support for graduate research is offered by the American Museum of Natural History, the Hudson River Foundation, the Lerner Gray Foundation, and Sigma Xi, among others.

For more information, contact the Office of Financial Aid and Student Employment at (516) 632-6840; or visit the office on the Web at *http://notes.cc.sunysb.edu/prov/finaid.nsf*.

How to Get Here

Directions to the State University at Stony Brook

By Automobile

Take the Long Island Expressway (Route 495) to exit 62 N; follow Nicolls Road (Route 97) north for nine miles.

By Railroad

Take the Long Island Rail Road's Port Jefferson (516-231-LIRR) line to Stony Brook. Cross tracks for campus bus.

By Bus

Call Suffolk County Transit (516-852-5200) for schedules, rates, and routes for buses to campus from many local towns.

By Air

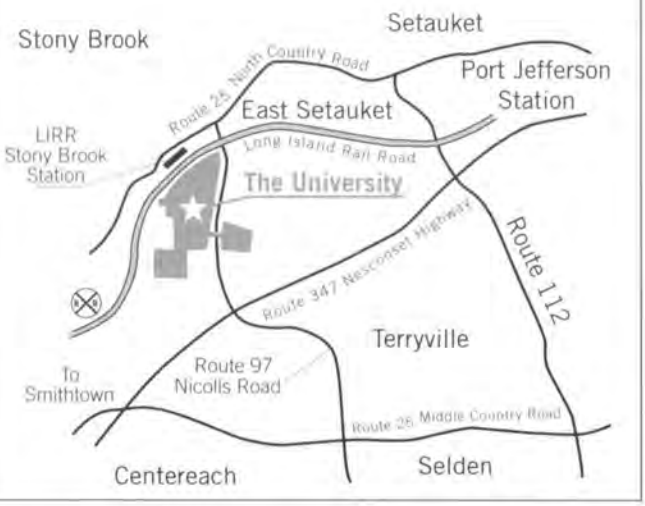
Land at Kennedy or LaGuardia Airport, 50 miles west of campus, or at Long Island MacArthur Airport (516-467-3210), ten miles south of campus. All airports offer limousine and taxi service to campus.

Ferry Connection

Connecticut car ferries run from Bridgeport to Port Jefferson (516-473-0286) and from New London to Orient Point (516-323-2525); call for schedules and information.

Long Island

University Area



This is a publication of the Office of Communications, 144 Administration, State University at Stony Brook, Stony Brook, NY 11794-0605.

For more information, visit us on the Web at *http://www.sunysb.edu*.

On the cover: A school of Atlantic silversides.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