

PROBING THE DEEP BLUE SEA — MSRC PROFESSOR DIVES IN PANAMA BASIN

Jim Mackin, Assistant Professor at the Marine Sciences Research Center, participated in a cruise to the eastern Pacific's Panama Basin headed by Fred Grassle and Bob Whitlatch, Chief Scientists, with other participants from Woods Hole and University of Connecticut as well as Professor Bob Aller of University of Chicago. The R/V Atlantis II was the tender for the Alvin, a deep submersible, which was used on this trip for a series of 14 dives in 4,000 m of water to study the effects of biological organisms on the chemistry of the sediments. The scientists took core samples and conducted incubation experiments on the sediment. They also used a dredge to gather animals which typically escape core sampling. "The amazing thing," noted Professor Mackin, "was the biological and chemical similarity of the deep sea sediment to the near shore."

Professor Mackin is interested in studying another chemical process or set of processes in the ocean. He has placed probes into the sediment at a depth of 4,000 m, to be left in place for two years, in order to determine how much, if any, mineral precipitation occurs, over the course of two years. "I've achieved the reactions in the lab, and now want to confirm that they are happening in the deep sea environment. These studies could have major implications for understanding how the ocean maintains a steady state of salinity." Meanwhile, he will be conducting similar experiments in the near shore environment at the MSRC Flax Pond. If similar processes occur in the deep ocean, they may occur at a slower rate, given the low concentrations of minerals as well as of nutrients compared to the near shore.

DISTINGUISHED VISITING SCHOLAR PROGRAM

The Center is continuing its Distinguished Visiting Scholar Program this semester. The program was initiated in 1982 and is designed to bring to the MSRC each year a small number of internationally renowned scholars for one to two weeks each.

Distinguished Visiting Scholars for the past academic year were
Professor K.F. Bowden, University of

Liverpool (England),

Professor Tom Fenchel of the University of Aarhus (Denmark),

Professor Simon Levin, Director of Cornell University's EPA Ecosystems Research Center,

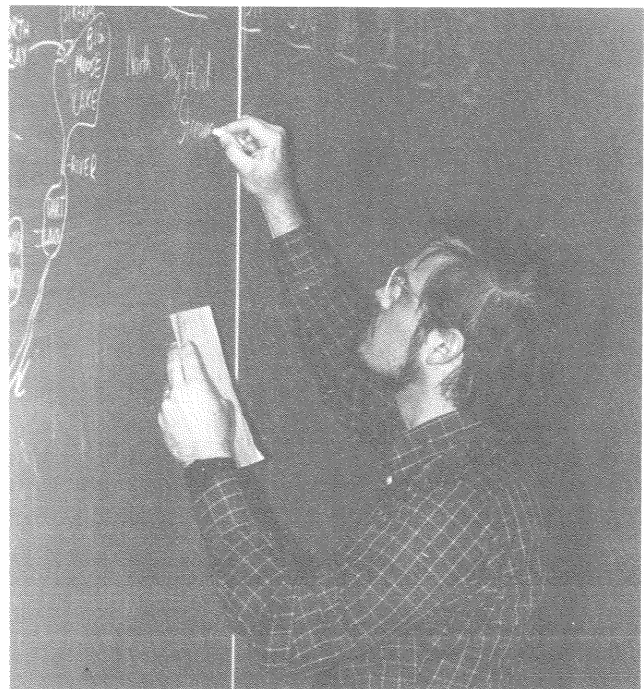
Professor Edward Boyle of the Massachusetts Institute of Technology,

Professor Leonard Pietrafesa of North Carolina State University,

Professor Mary Wilcox Silver of the University of California at Santa Cruz,

Professor John Simpson of the University College of North Wales,

Professor Robert Aller of the University of Chicago.



Distinguished Visiting Scholar Dr. Edward Boyle presenting a seminar at the Center.

MSRC PROFESSORS HEAD FIRST MAJOR STUDY OF PECONIC BAYS

MSRC Professors Harry Carter and Donald Pritchard are heading a two-year study of the circulation of the Eastern Suffolk waterway system. The investigation, the first of its kind in the history of the Peconic Bays, is being supported by the New York Sea Grant Institute, a cooperative activity of the State University of New York and Cornell

University. It will embrace the Peconic Bays estuary, including the Peconic River, Flanders Bay, Great and Little Peconic Bays and Shelter Island Sound.

The Peconic system is known both as a fisheries resource and a leading center for sport fishing. Unlike many waterways which have become polluted, the Peconic system is virtually unspoiled and may even be the least polluted coastal body of water in New York State. It is likely that human activity and demands for water-based uses will increase in the area in the foreseeable future giving rise to various exploitive pressures. The New York Sea Grant Institute wants the researchers to assess the possible results of the effects of multiple and conflicting uses and to provide information which can serve as a basis for making management decisions. The study includes two phases: a field investigation and mathematical modeling.

In addition, the Peconic system has features, i.e., it is a microcosm of much larger systems, such as Chesapeake Bay and Long Island Sound, that are of value for increasing our basic knowledge of the behavior of estuaries. However, not very much is known about the biological and chemical processes related to the water movement between the Peconic Bays. "We will be the first to extensively study circulation in the Peconics, and that's exciting," Carter and Pritchard said in a statement. "By collecting baseline information and developing models to forecast the impact of changes in the Peconic's system on circulation, we can help those involved in developing and protecting the Peconic's bountiful resources."

HIGH SCHOOL STUDENTS COLLABORATE WITH MSRC PROFESSOR IN PRESENTATION AT NEW YORK ACADEMY OF SCIENCES

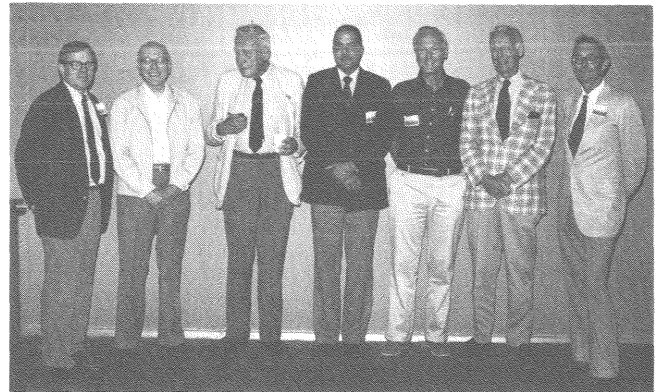
On Saturday, 19 May 1984, Operation Environment of the Junior Academy of the New York Academy of Sciences presented "New York's Changing Shoreline," where students from Bay Shore High School presented the results of a multi-year beach study they have been conducting in collaboration with Professor Henry Bokuniewicz and Mindy Zimmerman of the Marine Sciences Research Center.

For the past four years students in Jim Romansky's science class at Bay Shore H.S. have measured wave parameters and collected wave observations at twenty stations on Fire Island. These data are used to monitor the profile of the beach. The study is unusual in two respects: it covers a large area in a short period of time and it is a rare long-term measurement of beach processes. The data collected by the students are technically valid and analytically useful to

scientists at MSRC who are studying how the beach changes from month to month and from year to year. This is the first year that the Bay Shore students met with the Junior Academy.

The collaborative Bay Shore High School and MSRC presentation was the first time that high school students offered a presentation in the Operation Environment series.

The Junior Academy of the New York Academy of Sciences is a student-run, student-led program for the high school student who is interested in science. The program operates through the Educational Programs Department of the New York Academy of Sciences, and offers lecture series, field trips, career guidance, workshops and other opportunities to help the student's professional development.



J.R. Schubel (left), D. W. Pritchard (second from left) and Graham Giese (right) welcome (left to right) Dr. Roger Revelle, Dr. Randolph Bromery, Mr. Charles Entenmann and Dr. Charles Davidson.

MSRC HOSTS VISITING COMMITTEE

Earlier this year, the Marine Sciences Research Center established a Visiting Committee to help guide the Center in the next stages of its development. The Committee is made up of thirteen distinguished professors, business people and public figures. The Committee held its first meeting at the Center on 26-27 July 1984. The meeting started with dinner with President and Mrs. John H. Marburger III and included a full day of sessions with MSRC faculty and administrators.

The Committee members are: Dr. George S. Benton, Professor at Johns Hopkins University, and former Associate Administrator of the U.S. National Oceanic and Atmospheric Administrator (NOAA); Dr. Randolph W. Bromery, Commonwealth Professor and former Chancellor of the University of Massachusetts, Mr. E. Virgil Conway, President of the Seaman's Bank for Savings; the Honorable Hugh L. Carey, former Governor of New York; Mr. Gerald



focus on research

GOOD THINGS COME IN SUBMICRON PACKAGES

"If it's big enough to see, it can't be very important," is the tongue-in-cheek creed of the microbial ecologist. Probing and defining the role of the smallest creatures of the sea, the bacteria, is the daily pursuit of Dr. Doug Capone, Assistant Professor of Marine Sciences at MSRC. Heterotrophic bacteria are the ultimate recyclers performing the basic housekeeping functions of the sea by degrading organic material and returning inorganic nutrients to the waters to be reutilized by the plants of the ocean. Many of these plants are themselves microscopic (microalgae). Along with some special bacteria, termed the chemoautotrophs, the microalgae reassimilate and package the inorganic materials into their own cellular organic material - a process called primary production - thus forming the base of many of the food chains of the ocean.

Dr. Capone first became interested in marine microbiology during his graduate studies at the Rosenstiel School of Marine and Atmospheric Sciences of the University of Miami, from which he received his Ph.D. in 1978. In many marine ecosystems (as on land) the availability of nitrogenous nutrients (such as nitrate and ammonium) limits the growth of plants. For his Ph.D. work Doug examined the way an important rooted marine plant, the seagrass *Thalassia testudinum*, proliferates in tropical waters despite a paucity of available nitrogen. He determined that specialized bacteria, (N_2 fixers), in their root zones convert nitrogen gas into ammonium which is then used by the plants for growth. Similarly, he found N_2 fixing bacteria and blue green algae to be important in coral reef environments as well.

Doug's research methods go well beyond the qualitative approaches of classical microbiology. He uses a variety of modern techniques derived from analytical organic and inorganic chemistry, physiology, biochemistry and enzymology to examine directly the nature of bacterial processes which occur in the environment.

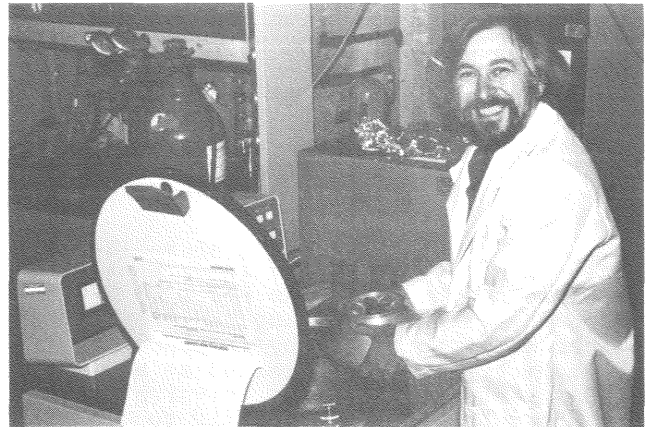
The microbiota of sediments has been a particular focus of Doug's recent efforts - particularly with respect to its interaction with the environmental



pollutants accumulating in the sediments. The bacteria of the sediments perform a variety of ecologically essential functions such as detritus degradation and mineral recycling. Doug and his laboratory group, with funding from NOAA, EPA and the Hudson River Foundation, have found many of the bacterial processes of the sediment to be inhibited by particular pollutants, suggesting a potential for serious repercussions from sediment toxification. On the other hand, Doug's group has found that sediment bacteria are capable of, and active in, degrading complex, synthetic organics - such as petroleum hydrocarbons - and thereby serve to purge marine environments of these contaminants.

In addition to his publication activity, which includes Nitrogen in the Marine Environment (edited with MSRC Professor Edward J. Carpenter), Doug has been actively involved in supervising MSRC graduate students' research. He was an invited speaker at the Symposium on Nitrogen Fixation in Aquatic Habitats at the annual ASLO meeting 1984 in Vancouver, B.C. and has been invited to speak at the Conference on Nitrogen Cycling in Marine Coastal Environments at the University of Aarhus (Denmark) in June 1985.

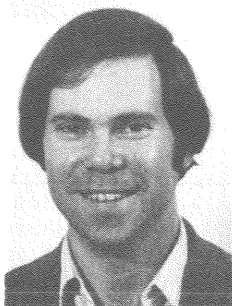
Doug also serves as Adjunct Assistant Professor of Marine Sciences at the University of Puerto Rico where he spent a week as Visiting Professor in November, 1983 and where he has an ongoing cooperative project with UPR on coastal eutrophication at La Parguera, P.R. He is also involved in cooperative projects on coral reef nitrogen cycling with the Australian Institute of Marine Sciences and on tropical seagrass nutrition and ecology with colleagues from the University of New Hampshire.



Dr. Capone loads samples into a high-speed centrifuge.

RADIOACTIVITY IS A POWERFUL OCEANOGRAPHIC TOOL

When Kirk Cochran asks how long it takes a chambered *Nautilus* to produce its beautiful shell, how old a salt marsh is, or what happens to wastes dumped in the ocean, he intends to find out by using radioactive isotopes. Dr. Cochran's research is devoted to understanding a variety of marine processes through the use of radioactive elements. "It is constantly interesting because there are so many possibilities to study--different chemical systems, deep-sea and nearshore environments --so much," says Dr. Cochran.



Radionuclides which become associated with sediments or marine deposits can be used to time events related to those deposits. In addition, the study of radioactive disequilibria--departures from the expected relative concentrations of various isotopes--can be used to identify and describe processes affecting those isotopes. The decay rate of an isotope determines the time scale of the processes to which it can be applied, and its chemistry (affinity for particles, for example) may make it more suited for certain types of processes. Picking the right radioisotope is clearly the key to being able to use the unique features of each effectively.

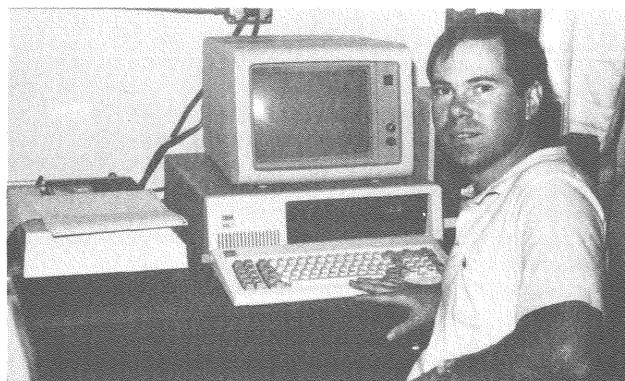
Dr. Cochran's approach in studying a problem is to pose the basic questions, then determine which isotope(s) will allow him to address the questions. Dr. Cochran's interest is finding ways of applying techniques of radioisotope analysis to a variety of problems. "I want to avoid the routine, the mechanical. My greatest satisfaction comes from finding and pursuing new applications." Applications of particular interest to Dr. Cochran include using radioactive tracers to determine the rates of sediment accumulation in nearshore and deep-sea environments, the rate of bioturbation (mixing of sediment particles by indwelling animals), growth rates of animals and manganese nodules, and the fate of radioactive elements which enter the ocean.

His career began when, as a high school student, he worked in J. Kenneth Osmond's geochemistry lab under an NSF Secondary Science Training Program. There he became so intrigued by radionuclide geochemistry that he enrolled as an undergraduate at Florida State University. His undergraduate work led him to publish a report on radium geochemistry in Indian Ocean sediments. In 1973 he went to Yale University, where he worked with Karl

Turekian, and received both Master's (1975) and Ph.D. (1979) degrees. His doctoral dissertation on radium isotopes in marine sediments was the first major work on the chemistry of radioisotopes in sediment pore water. He stayed at Yale as a research geochemist for two years, then went to Woods Hole Oceanographic Institution as an assistant scientist. During the years at Yale and Woods Hole Dr. Cochran worked on sediment core chronologies, aspects of atmospheric particle transport and bioturbation of sediments, manganese nodule growth, shell growth rates in *Nautilus*, nearshore clams and the deep-sea hydrothermal vent clams, and the distribution and fate of a variety of man-made radionuclides. By doing so he helped develop techniques to use the tandem accelerator to permit much more sensitive analyses of several radionuclides. In 1983, following his Woods Hole appointment, Dr. Cochran came to the MSRC as an Assistant Professor.

In his recent work Dr. Cochran has concentrated on the fate of particle-reactive radionuclides, such as thorium, when they enter the marine environment. Currently, he is particularly interested in sea-bed disposal of radioactive wastes, and in one of his projects he is studying scavenging of particle-reactive radionuclides by suspended particulate matter in the deep ocean. He serves as one of the U.S. representatives to the Seabed Working Group, an international scientific group which is evaluating the suitability of ocean disposal of radioactive wastes. In another project Dr. Cochran is studying the way in which radionuclides removed from the water column are distributed in the bottom sediments of the equatorial Pacific.

No matter what the project, Dr. Cochran always tries to see the applications as part of a larger picture. He cites, as an example, the fact that bioturbation rate measurements can be applied to the study of the transformations of other elements, such as carbon, in the sediments. "What appeals to me is the advance in our knowledge as a result of the rapid advances in sampling and analytical techniques."



Dr. Cochran, analyzing geochemical data.

Cohen, President of Lawrence Aviation; Dr. Charles S. Davidson, William B. Castele Professor of Medicine Emeritus, Harvard University and Senior Lecturer in Medicine at Massachusetts Institute of Technology; Mr. Charles Entenmann, formerly of Entenmann's Bakery; Mr. George J. Gillespie III, partner in the law firm of Cravath, Swaine & Moore; Dr. James McCarthy, Director of Harvard University's Museum of Comparative Zoology and Agassiz Professor of Oceanography; Professor M.P. O'Brien, Professor Emeritus and former Dean of Engineering at the University of California, Berkeley; Professor Roger Revelle of Scripps Institute of Oceanography; the Honorable William E. Simon, Chairman of Wesray Corporation and former Secretary of the Treasury; and Dr. Harry Woolf, Director of Princeton's Institute for Advanced Studies.

During the Committee's visit researchers in the program areas of fisheries and aquaculture, nearshore and beach processes, and coastal information management presented overviews of their research in order to acquaint the Committee members with some of the Center's long-term programs. In addition, the Committee had an opportunity to meet faculty, staff and students during the day.

AWARDS

GLYNIS NAU-RITTER, BARRY SNYDER, RAY VALENTE and MOON-JIN PARK received Summer Research Fellowships from the Graduate School.

Sea Grant Scholarships for 1984 were awarded to JENNIFER EPP and DEBRA YEDWABNICK.

SCOTT SIDDALL received a New Initiatives Award from NY Sea Grant to study aspects of the early life history of the bay scallop, *Argopecten irradians*.

GENE FELDMAN received a Sigma Xi award for Achievement in Research.

VALRIE GERARD's proposal to characterize light-related ecotypes of the seaweed *Laminaria saccharina* in Long Island Sound, submitted to Graduate Women in Science, received Honorable Mention.

PEOPLE AND MEETINGS

KIRK COCHRAN attended a Sandia National Laboratories Workshop on "Biological Oceanography Related to Seabed Disposal of Nuclear Waste," held in Berkeley, CA on 29-30 May.

PETER WEYL presented a paper at the ICES "Symposium and Workshop on Contaminant Fluxes through the Coastal Zone" in France

14-18 May.

GENE FELDMAN presented a poster at the May American Association for Advancement of Science annual meeting in New York City.

LISA CAMPBELL participated in a research cruise to Bermuda and back 20 July-10 August to study the photonutritive regulation of the Cyanobacteria species, *Synechococcus*.

SCOTT SIDDALL, ROBERT MALOUF, MONICA BRICELJ, GREGG RIVARA and JENNIFER EPP attended the National Shellfisheries Association in Tampa, FL, 24-28 June. Professor MALOUF was elected Vice-President of the NSA, and Professor SIDDALL succeeds him as Secretary/Treasurer. BOB MALOUF and SCOTT SIDDALL presented a paper on hard clam culture in New York State.

VALRIE GERARD presented seminars at the University of Rhode Island on 10 April, and at the Smithsonian Environmental Research Center, MD, on 11 May.

On 24 April PETER WEYL demonstrated the Port of NY/NJ Information System to staff members of the National Oceanic and Atmospheric Administration and the Maritime Administration in Washington, DC. The System was demonstrated to the New York emergency response team, by JOHN ELLSWORTH and TOM GULBRANSEN.

VALRIE GERARD attended the Gas Research Institute Marine Biomass Contractors meeting in Key West, FL, and the Northeast Algal Symposium in Woods Hole in April.

PETER WEYL visited the University of Las Palmas, on Grand Canary Island, Spain, in May to help develop a research program in chemical oceanography.

In May J.R. SCHUBEL travelled to the Canary Islands to participate in Spain's Second Conference on Education in the Marine Sciences which was held at the Universidad Politecnica de las Palmas. In June he attended the Korea-U.S. Seminar and Workshop on Marine Geology and Physical Processes in the Yellow Sea held in Seoul, Korea. He also visited Chonnan University in Korea and a number of other oceanographic and mariculture institutes in Korea, Japan, and Hawaii.

LINDA DUGUAY presented a paper on "Disruption of pelletized sediments by shallow water benthic foraminifera" at the 47th Annual Meeting of American Society of Limnology and Oceanography at the University of British Columbia in June.

KIRK COCHRAN was chosen for a three year term on the University National Oceanographic Laboratory System *Alvin* Review Committee, which reviews requests to use the submersible *Alvin*.

CURRENT RESEARCH

KIRK COCHRAN has received funding from NSF to study particle mixing rates in deep-sea sediments of the eastern equatorial Pacific. He will use ^{210}Pb to measure the intensity of bioturbation in deep-sea sediments.

He also received additional support from Sandia National Laboratories to continue his studies of a proposed deep-water radioactive waste disposal site for scrapped nuclear submarines.

PETER WEYL has started a new project to adapt the Port of New York/New Jersey information system for use in the permitting process by the New York District, U.S. Army Corps of Engineers.

MALCOLM BOWMAN and ROBERT WILSON will be analyzing data collected by the Institute of Ocean Sciences of Vancouver Island as part of a joint US/Canadian study of ocean eddies. A large oceanographic sampling effort designed to elucidate the factors maintaining a large-scale "trapped" eddy in a strait at the Alaskan/Canadian border is being funded in part by the Office of Naval Research. The eddy being studied is about 50 km in diameter. Its biological importance is underlined by the fact that it supports an important Dungeness crab fishery by serving as a retention mechanism for larval crabs.

PUBLICATIONS

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rate of *Nautilus* in nature. Nature 308: 725-727.

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MSRC ASSOCIATES

We welcome as New Associates

Dr. and Mrs. Graham S. Giese

and are pleased to have as Continuing Associates

Mr. Walker McKinney
Mr. David Sayre
Mr. William Swan



Faculty, staff and students attended a reception at the Marine Sciences Research Center in May in honor of the graduating students.



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