

Dr. Partch tries out a local means of transport on a beach near Karachi, Pakistan.

MSRC FACULTY VISIT PAKISTAN FOR TEACHING AND RESEARCH

Professor Eric Partch and MSRC Director J.R. Schubel spent two weeks in Pakistan participating in a National Science Foundation-funded Training Program in Oceanography. The program was hosted by the National Institute of Oceanography Pakistan, directed by Dr. G.S. Quraishie. NIO has existed only since 1982 and is vigorously expanding its facilities and programs.

Dr. Partch taught physical oceanography while Dr. Schubel taught geological oceanography. Ninety-four Pakistanis from universities, governmental agencies and industry took the course, which was designed to provide them with basic knowledge about their country's marine environment. Students were exposed to the basic principles of coastal marine science and got an opportunity to visit and sample various environments. According to Dr. Partch, one of the most satisfying aspects of the experience was seeing an increase in mutual respect and understanding between students who formerly, as members of different organizations, rarely communicated on issues such as resource management, pollution control or even basic research.

Dr. Partch spent an additional week in Pakistan during which he organized and led a cruise to the Indus River delta to make a preliminary assessment of the size and character of the estuarine region. The estuary, which had been hypothesized to be

almost nonexistent because of total diversion of fresh water for irrigation, proved to be a rich environment with abundant fish and shrimp, both of which supported substantial estuarine and coastal fisheries. On the other hand, the salinity intrusion, which has lengthened greatly in the last thirty years, has virtually destroyed agricultural production in the lower delta.

Both Dr. Partch and Dr. Schubel look forward to a cooperative study with the Pakistanis of the physics and geology of the Indus River estuary.



Vice-President Wu (left) and President Yuan, Yun-kai, both of East China Normal University, with MSRC Director J.R. Schubel and Professor C.N. Yang (right), Director of SUNY Stony Brook's Institute for Theoretical Physics, at the signing of the Memorandum of Understanding in Shanghai, China.

STONY BROOK AND EAST CHINA NORMAL UNIVERSITY TO COLLABORATE

On 24 January 1985 at a ceremony in Shanghai, China, Professor J.R. Schubel, Dean of MSRC, and Professor C.N. Yang, Director of the State University of New York at Stony Brook's Institute for Theoretical Physics, completed negotiations of a Memorandum of Understanding between East China Normal University and Stony Brook. The agreement established the two institutions as cooperating universities and calls for collaboration to begin in the marine sciences with possible extension into other areas. Schubel met with Professor Chen, Ji-yu, Director of East China Normal University's Institute of Estuarine and Coastal Research, to develop plans for collaborative research in coastal

processes and coastal management in the greater Shanghai area and with Professor Yu, Kao Huai, Director of the Chinese National Bureau of Oceanography's (NBO) Second Institute of Oceanography to plan a cooperative study of the circulation and sedimentation of Hangzhou Bay. China's NBO will propose this study as one element of the program to be carried out through the Sino-American agreement between China's NBO and the U.S. National Oceanic and Atmospheric Administration (NOAA).

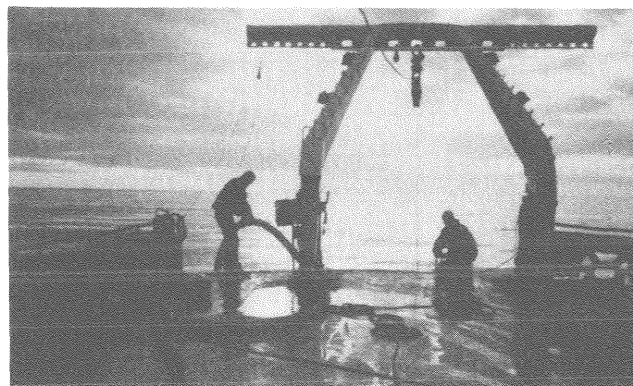
MSRC SCIENTISTS STUDY MICROBIAL PROCESSES IN THE CHESAPEAKE BAY PLUME

MSRC Assistant Professor Jed Fuhrman and his student, George McManus, joined scientists from the University of Maryland, the University of Delaware, Woods Hole Oceanographic Institution, and Bigelow Laboratory for Ocean Sciences in the National Science Foundation's multidisciplinary program, Microbial Exchanges and Couplings in Coastal Atlantic Systems (MECCAS). The project's first cruise, aboard *R/V Atlantis* took place in February. Additional cruises are scheduled for August, September and March.

MECCAS scientists are studying how physical forcing functions affect the interactions among nutrients, phytoplankton, bacteria and zooplankton in the plume of the Chesapeake Bay estuary. Dr. Fuhrman's role in the MECCAS project is to investigate carbon flow and nitrogen cycling within the plankton resulting from microflagellate grazing on bacteria and the release and uptake of dissolved free amino acids.

Research into the interactions among primary production, the release of organic nitrogen compounds, their utilization by bacteria, and subsequent consumption of the bacteria by higher trophic levels explores trophic interactions on time and space scales of great current interest. The flux of amino acids from phytoplankton into the water is thought to be the highest of any organic compounds, constituting as much as 30 percent of the total primary production. Most of the flux is utilized by bacteria, which may derive as much as half of their biomass from amino acids. Rapid bacterial growth may regenerate much of the nitrogen contained in the amino acids. In the amino acid work, Dr. Fuhrman is utilizing a tritium isotope dilution technique to label pools of amino acids and follow them through various components of the planktonic food web. Recent advances in high pressure liquid chromatography and radioisotope detection technology permit investigators to follow several different amino acids simultaneously, which greatly increases the detail in which microbial transformations can be studied.

For the grazing studies Fuhrman and McManus use fluorescence microscopy and brightly fluorescent pigment particles to determine both the nature of the grazer community and grazing rates. They hypothesize that grazing by microzooplankton is a trophic link which, although virtually unstudied, is second in magnitude only to the familiar phytoplankton to zooplankton path. They suggest that protozoans, by consuming bacterial production, make the flux of dissolved organic substances from phytoplankton available to larger consumers.



Scientists collect water samples off the stern of the *R/V Atlantis* during the MECCAS cruise.

H.H. CARTER AWARD ESTABLISHED

Through the generosity of Professor Harry Carter the Center has been able to establish the H.H. Carter Award. The annual award of \$500 is intended to assist an outstanding student in the conduct of his or her field work. With its stipulation that it be used to support field work, the award reflects Professor Carter's commitment to the integration of theory with practical results.

DISTINGUISHED VISITING SCHOLAR PROGRAM

The Center's Distinguished Visiting Scholar Program continued during the spring semester with visits by four scholars. The program was initiated in 1982 to bring a small number of internationally renowned scientists to the MSRC for one or two weeks each.

Dr. J. Dronkers, senior research scientist at the Rijkswaterstaat, Den Haag, Netherlands, visited the Center 4-8 March, presenting several seminars on sediment transport and mixing in estuaries.

Professor R.W. Howarth, of the Marine Biological Laboratory at Woods Hole, presented seminars on sediment and nutrient chemistry and marine pollution during his visit on 18-22 March.



focus on research

A SCIENTIST'S VIEW OF SHELLFISH

The bay scallop, *Argopecten irradians*, supports a major fishery in Long Island's Peconic Bay. Most of us think of scallops simply as a welcome seasonal delicacy. For Professor V. Monica Bricelj, however, scallops are an ideal model for studying a whole suite of questions on the ecology, physiology and genetics of commercially important molluscs. Dr. Bricelj, an Adjunct Assistant Professor of Marine Sciences at MSRC, studies the physiological ecology and energetics of benthic organisms, especially bivalve molluscs. As herbivores which feed by pumping enormous volumes of water, these organisms are a key element in estuarine food webs and nutrient cycles.



Dr. Bricelj, a native of Argentina, came into marine sciences gradually, following an initial interest in foreign languages and the humanities. She specialized in aquatic ecology, and conducted freshwater finfisheries research in Argentina for two years after receiving her Licenciatura in 1974 from the University of Buenos Aires. In 1977 she fulfilled her desire to study in the United States by winning a Fulbright-Hays Fellowship in marine sciences. She chose to attend the Marine Sciences Research Center because its interdisciplinary approach to science reflects her own outlook.

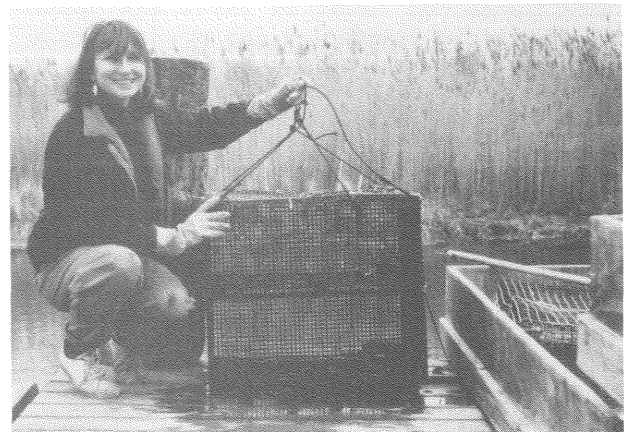
Dr. Bricelj received her M.S. from SUNY-Stony Brook in 1979, with a study of reproduction in the hard clam, *Mercenaria mercenaria*. She continued her studies at MSRC, receiving her Ph.D., degree in Coastal Oceanography from SUNY-Stony Brook in 1984. Her dissertation, a study of the effects of suspended sediments on the feeding and growth of hard clams, won the Steinberg-Squires Award for the best graduate thesis of the year. After a brief period as a Postdoctoral Research Associate she joined the faculty of Southampton College, Long Island University and received her adjunct appointment at MSRC.

Currently, Dr. Bricelj is working on the bay scallop with Professor Malouf and Jennifer Epp, one of his students. They have found that neighboring scallop populations differ considerably in their rates and patterns of growth and reproduction. They hope to be able to apply their

results to current management practices in the scallop fishery of Long Island, thereby improving yields. They are also carrying out a study of the physiological performance of first and second year scallops to investigate overwintering and the aging process in these short-lived molluscs, which rarely survive their second winter.

In the future, Dr. Bricelj plans to exploit the unique biological characteristics of the scallop, namely its very rapid growth, short lifespan, and hemaphroditic condition, by collaborating with Dr. Koehn of SUNY-Stony Brook's Ecology and Evolution Department, in a study of mariculture and strain improvement possibilities through cloning and genetic manipulation. Finally, she hopes to participate in MSRC Professor Ed Carpenter's studies of the transfer of red tide organisms in shellfish. Redtide dinoflagellates have recently been identified in Long Island waters, raising a potential health hazard for shellfish consumers.

Dr. Bricelj notes that she tends to follow new, unforeseen directions as they occur. "I find the topic of senescence in scallops fascinating, although I knew little about it only a year ago." Despite her current interest in scallops, she says, "I'm not committed to scallops, or to shellfish. I am interested in near-shore processes and factors controlling the high secondary production in estuaries. In a more general way, I am interested in doing basic research that has practical applications. Fisheries are one such area, and on Long Island shellfish are a major resource, so I have focused on them. But I am open-minded about where to go next; after molluscs, who knows?"



Dr. Bricelj brings aboard a dredge full of clams.

A NEW LOOK AT THE NITROGEN CYCLE

"The thing that attracts me to microbiology is the elegance of the experiments," says MSRC Assistant Professor Sarah Horrigan, who studies the bacteria which effect the transformations of nitrogen in the sea. Nitrogen is one of the crucial building blocks of living matter. Yet despite its abundance in our atmosphere, nitrogen in a form usable to organisms, i.e. combined, rather than molecular, is in short supply. As a result, the available nitrogen is taken up, transformed and lost in complex patterns of rapid interactions among bacteria, plants, protozoa and animals.

Nitrogen cycling occurs wherever there are living organisms, but the differences between environments in terms of the types of organisms present and physical and chemical factors such as the amount of light, oxygen and water flow give Dr. Horrigan virtually unlimited opportunities for her studies. For example, the planktonic community is characterized by uptake of certain nitrogen compounds by algae, so that a major pathway of nitrogen is through plants. In many benthic habitats, however, plants are insignificant, and nitrogen compounds released by excretion, decay and various chemical processes are utilized by a whole suite of bacteria. The variety of potential pathways, the speed of many of the reactions, and the difficulty of sampling and analyzing the critical components make Dr. Horrigan's task a formidable one.

Dr. Horrigan became interested in marine science after spending a summer at the Bermuda Biological Laboratory, when she was an undergraduate at Carleton College, in Northfield, MN. She graduated summa cum laude in 1974, and spent the following summer at the Woods Hole Oceanographic Institution working on the effects of PCBs on the growth of marine bacteria. The experience crystallized her desire to go into oceanography, and when she received a Thomas J. Watson Fellowship in 1974 she spent a year studying mariculture and hatchery operations in Japan, Sweden and Palau. Knowing that she was interested specifically in marine microbiology, Dr. Horrigan decided to obtain a good background in microbiology before entering a marine science institution. Accordingly, she spent a year in the Department of Bacteriology at the University of Wisconsin before transferring to the Scripps Institution of Oceanography in 1977 as an NSF Graduate Fellow. She received her Ph.D. degree in 1981 with a dissertation on the role of phytoplank-

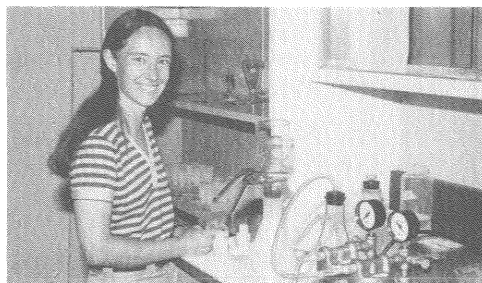


ton and nitrifying bacteria in determining the distribution of nitrogen in the marine environment, and came to MSRC in 1982.

The key to Dr. Horrigan's approach is her use of various isotopes of nitrogen. The heavy stable isotope, ^{15}N , can be used as a tracer to follow the flux of nitrogen into its various compartments, and can be used both in laboratory cultures and field populations. Alternatively, the natural abundance of the heavy stable isotopes in different compartments can be measured. ^{15}N comprises 0.37% of all naturally occurring nitrogen, and is discriminated against in biochemical reactions. This means that organisms tend to take up ^{14}N preferentially, but to retain the ^{15}N that they do accumulate. Sensitive mass spectrometers can distinguish variations in the naturally-occurring ^{15}N in various pools, thus allowing Dr. Horrigan to deduce rates of nitrogen transformation processes from the combination of field measurements of the natural abundance of ^{15}N and calibration of the fractionation processes in controlled laboratory situations.

Currently, Dr. Horrigan is working on the nitrogen cycle in Chesapeake Bay water and in the sediments of Great South Bay, as well as on intercalibration of different labeling techniques. In the Chesapeake Bay study her tracer experiments have shown that nitrite production from nitrification does occur in the water column. This means that bacteria must be taken into account as well as phytoplankton when one is considering nitrogen uptake. The Great South Bay study is interesting because of the simultaneous occurrence of several nitrogen transforming processes within the sediments. In the intercalibration study Dr. Horrigan is using the cyclotron at Brookhaven National Laboratory to produce ^{13}N -labeled compounds which she can use to study short-term transformations (the half-life of ^{13}N is only 10 minutes). She will then compare her results to the results of studies using ^{15}N -labeled substrates.

Dr. Horrigan approaches all her projects from a common perspective. "I want to combine laboratory and field studies of nitrogen transformations, understanding the limitations of both. I want to understand what is going on in the natural world, and at the same time I am always seeking the elegance of the laboratory."



Sarah Horrigan filters samples for productivity analyses.

Dr. H. Postma, Director of the prestigious Netherlands Institute for Sea Research and an internationally renowned expert on coastal transport processes, visited the Center between March 27 and 2 April. In addition to several seminars, Dr. Postma presented a minicourse, Particulate Matter in Coastal Waters.

Professor Scott Nixon, Director of Rhode Island Sea Grant and Professor at the University of Rhode Island, visited the Center April 15-19. Dr. Nixon is highly distinguished in the field of coastal and wetlands processes, particularly nutrient and energy cycling.



J.R. Schubel, Director of MSRC (left) and G. Cohen, Chief Executive Officer of Lawrence Aviation and sponsor of the Distinguished Visiting Scholar Program, with Dr. H. Postma, Director of the Netherlands Institute for Sea Research.

CURRENT RESEARCH

VALRIE GERARD and KEVIN DUBOIS have started a new research project to study genetic differentiation between populations of kelp from different areas of Long Island Sound and New England.

SETH YARISH participated in a week-long cruise to the Panama Basin in April aboard the *R/V Atlantis II*. The scientific crew collected water column and sediment samples and retrieved sediment probes installed a year ago in DR. R. ALLER'S long-term study of geochemical processes in deep ocean sediments.

FRANK ROETHEL received a \$136,000 grant from the New York State Legislation Commission on the Water Resource Needs of Long Island to investigate the feasibility of stabilizing incineration ash for possible disposal at sea in an artificial reef.

PEOPLE AND MEETINGS

VALRIE GERARD attended the Carolina Conference on Marine Biotechnology in Chapel Hill, NC. 24-26 March.

DAVID GOODRICH presented a paper entitled "Wind-induced mixing in the Chesapeake Bay" at the American Geophysical Union's

Spring Meeting in Baltimore, 27-31 May. The paper's co-authors are WILLIAM BOICOURT, PETER HAMILTON, and DONALD W. PRITCHARD.

VALRIE GERARD presented a seminar, "Developing marine biomass as a new energy resource" at Dalhousie University, Halifax, Nova Scotia on April 25.

LISA CAMPBELL was invited to present a seminar in M.I.T.'s Aquatic Science Seminar Series in March. She discussed the use of immunofluorescence to study marine cyanobacteria. She presented a similar seminar in April at the Marine Sciences Institute of the University of California at Santa Barbara.

As part of MSRC's cooperative agreement HENRY BOKUNIEWICZ visited the Universidad de Las Palmas, in the Canary Islands, where he presented a seminar entitled "Metodos de trabajo en geologia de playas" and discussed the cooperative projects with Spanish scientists.

HENRY BOKUNIEWICZ presented two seminars at Duke University on 11 and 12 April. The first was on coastal geometry and the sediment budget of Long Island's South Shore and the second presented the results of multi-year beach surveys on Long Island's south shore.

KIRK COCHRAN attended a meeting of the *Alvin* Review Committee in Woods Hole, MA, 5-9 May. The purpose of the meeting was to review proposals for use of the submersible.

PUBLICATIONS

BRICELJ, V.M., R.E. MALOUF and C. DEQUILFELDT. 1984. Growth of juvenile *Mercenaria mercenaria* and the effect of resuspended bottom sediments. *Marine Biology* 84:165-173.

COCHRAN, J.K. 1985. Particle mixing rates in sediments of the eastern equatorial Pacific: evidence from Pb-210, Pu-239, 240 and Cs-137 distributions at MANOP sites. *Geochimica et Cosmochimica Acta* 49:1195-1210.

GERARD, V.A. 1984. Physiological effects of El Niño on giant kelp in southern California. *Marine Biology Letters* 5:317-322.

McHUGH, J.L. 1984. The inshore catch of food fishes in the Raritan Bay area. Pages 11-23 in Pacheco, A.L. (ed.) *Raritan Bay, Its Multiple Uses and Abuses*. Sandy Hook Laboratory, Tech. Ser. Report No. 30.

OKUBO, A. and J.J. ANDERSON. 1984. Mathematical models for zooplankton swarms: their formation and maintenance. *The Oceanography Report*, EOS, 65:731-732.

RECENT MSRC GRADUATES

1984 Ph.D. Degrees

Name: Filadelfo, Ronald J.
Advisor: Robert E. Wilson
Thesis: Sub-tidal current variability in the New York Harbor estuary

Name: Buckner, Stuart C.
Advisor: Robert E. Malouf
Thesis: Aspects of the Population Dynamics of the Hard Clam, *Mercenaria mercenaria* L.

Name: Park, Yong C.
Advisor: Edward J. Carpenter
Thesis: Nitrogen regeneration and glutamate dehydrogenase activity of zooplankton in Great South Bay

1984 M.S. Degrees

Name: Lee, Jin-Ae
Advisor: B.H. Brinkhuis
Thesis: Seasonal growth and reproduction patterns of *Laminaria laminaria* in Long Island Sound

Name: Chang, Jeng
Advisor: E.J. Carpenter
Thesis: Blooms of the Dinoflagellate *Gyrodinium aureolum* in a Long Island estuary: Box model analysis of bloom maintenance

Name: Douillet, Philippe
Advisor: R.E. Malouf
Thesis: Effect of bacteria in the nutrition of the brine shrimp *Artemia* fed on dried food diets

Name: Paige, Carrie
Advisor: H.J. Bokuniewicz
Thesis: The settling flux of particles in Long Island Sound

Name: Chung, Ik-Kyo
Advisor: B.H. Brinkhuis
Thesis: On the copper effect of the early stage of *Laminaria saccharina*

Name: Bauer, James E.
Advisor: D.G. Capone
Thesis: Interactions between four model organic pollutants and microbiota of coastal marine sediments

Name: McKown, Kim A.
Advisor: W.T. Peterson
Thesis: Age, growth, and feeding ecology of sand lance, *Ammodytes americanus*, in Long Island Sound

Name: Shieh, Chih-Shin
Advisor: F.J. Roethel
Thesis: Stabilizing sewage sludge using fly ash; physical and chemical behavior in seawater

Name: Doris-Forbes, Valery E.
Advisor: G.R. Lopez
Thesis: Feeding selectivity of the mud snail, *Hydrobia totteni*

Name: Heins, Stephen W.
Advisor: D.O. Conover
Thesis: Effects of clutch sequence, photoperiod and salinity on sex ratios in the Atlantic silverside *Menidia menidia*

Name: Lechich, Alex F.
Advisor: F.J. Roethel
Thesis: Stabilization of titanium processing wastes within a fly ash matrix

Name: Gulbransen, Thomas C.
Advisor: P.K. Weyl
Thesis: Development of a microcomputer-based information system for the port of New Orleans

Name: Hwang, Sheng-Ping Lucinda
Advisor: B.H. Brinkhuis
Thesis: The relationships between nitrate uptake rate, growth rate and the sizes of different internal nitrogen reserves in *Gracilaria tikvahiae* (Rhodophyta)



Dr. Eric Partch photographed this fishing vessel on the Indus River during his recent trip to Pakistan.



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