

# Marine Sciences Research Center



N E W S L E T T E R

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*(From left) Franco Russo from Bari, Italy, MSRC graduate student Vera Agostini, and professor Bruce Brownawell discuss groundwater contamination.*

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## NEW INTERNATIONAL PARTNERSHIPS FOR THE ENVIRONMENT

### Italian Scientists Get MSRC Guidance on Handling Wastes

**M**unicipal leaders and scientists from the southeastern region of Italy, known as Apulia, met for a two-day conference in March with scientists and waste management experts from MSRC, the NY State Department of Environmental Conservation, and other regulatory agencies. Their mission, aided by translator and MSRC graduate student Vera Agostini—also from the Apulia region—was to trade ideas and learn about U.S. trends and technologies for handling wastes.

"This initial bilingual exchange of information on waste issues is a first step in creation of an international environmental center in Apulia, with MSRC as a full partner with the Politechnico Institute of Bari," said MSRC Director, J. R. Schubel. A second conference will take place in Bari, Italy in autumn, 1992.

President Frank A. Cipriani of SUNY College of Technology at Farmingdale and Schubel will meet with officials in Italy in July to plan the autumn conference. Cipriani has been instrumental in forming this partnership.

At the autumn meeting, conferees will focus on integrated water and wastewater management and integrated solid waste

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*Dr. Peter Liberathy of the Institute for Water Pollution Control in Budapest, Hungary*

### Eastern Europeans Seek MSRC's Help to Mend Their Environment

**I**n a big step toward scientific cooperation with the countries of the former Communist bloc, MSRC's Coastal Ocean Action Strategies (COAST) Institute, the University at Stony Brook's Office of International Programs, and Newsday sponsored a workshop for marine and aquatic scientists from former Soviet bloc countries. Participants included Russia, Estonia, Croatia, Bulgaria, Hungary, Czechoslovakia, Romania, the former East Germany, a representative of the United Nations International Atomic Energy Agency in Monaco, scientists from Canada

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management. Under these two categories, they will choose which problems to tackle, based on their importance and whether they can be solved within two years of the conference. The latter requirement depends on the state of scientific and technical knowledge available to solve them.

Graduate student in geological oceanography Matt Morgan demonstrates how waves erode beaches at Open House. (Photo by Byron Boekhoudt)



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and the U.S., and nine student observers from the Central European University, Budapest.

The intent of this meeting held at MSRC in April was to draw upon the experiences gained in the west to assess the extent of toxic contamination and eutrophication (over-fertilization of lakes and coastal waters) in the east and, with east-west scientific cooperation, to work toward solving these problems. Another intent was to foster relationships and cooperation among the eastern European countries themselves, since many of their pollution problems cross neighbors' borders.

The visitors opened the workshop by summarizing their most serious problems, a result of years of indifference to pollution by the former communist-bloc governments. Just how serious these problems are could be learned from Konstantin Korotenko's report:

*Pollution problems in most of Russia's seas, lakes, rivers and other aquatic systems are in a catastrophic state. There are some areas, particularly shallow lakes and seas, where irreversible changes have already occurred, for example, the northwestern Black Sea, the Sea of Azov, and the Caspian Sea.*

There are a number of obstacles to pollution remediation in these countries: the lack of reliable scientific data, the absence of funding, dissolution of scientific administrative structures, and the inaccessibility of information,

modern equipment, and analytical techniques. But prompted by the severity of the situation in eastern Europe, attending scientists recommended future collaborative research projects and a plan to seek funding sources to support research, pollution abatement, and cleanup.

The workshop report of recommendations will be sent to the United Nations Association for endorsement. Besides the formal plan for collaborations set out in the report, a number of MSRC-eastern European collaborative projects may emerge, as well as training programs in pollution abatement for students and scientists.

Melissa Beristain of NY Sea Grant demonstrates fish printing at Open House. (Photo by Byron Boekhoudt)



## Nearly 1,000 join MSRC's Earth Day-Open House Celebration

To celebrate Earth Day this past April, the Marine Sciences Research Center opened its doors to nearly 1,000 people from all over Long Island—from Brooklyn to Westhampton Beach, and from Sayville to Setauket. Teachers brought their classes, parents brought their children, and most stayed hours to take part in the many hands-on displays and demonstrations constructed by MSRC faculty, staff, and students and New York Sea Grant Institute staff.

Visitors could learn from the marine geologists how waves erode a beach and what a core from the sea floor can tell scientists. From the Waste Management Institute, visitors could learn about recycling, use of waste materials to make secondary products, and composting; and from the Living Marine Resources Institute and Fisheries group about the fishes that live around Long Island

and how different their young (larvae) look.

Open House guests of all ages tested their environmental awareness via computer quiz; identified a number of marine plants and animals using a printed "key"; and

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Steven Morgan

### Cues, Clocks, and Crab Reproduction: Synchrony for Survival

**A**dult crabs mate, reproduce, and disperse their newly hatched larvae to the tides and currents that carry them offshore, away from the predator-filled shallows. Eventually they return to shore, settle, and become adults; and the cycle begins again. Each species has its own precisely timed biological rhythms, and different populations of each species have their own precise rhythms.

What are the environmental pressures that drive these animals to time events in their lives so precisely and what are the cues that synchronize these activities? Marine ecologists have traditionally addressed these ecological and evolutionary questions by examining the adult crabs. Steven Morgan, MSRC Assistant Professor of marine biology, however, takes a different approach.

He asks the question, "What are the environmental pressures acting on the *larvae* that ultimately shape the species' behavior, ecology, and morphology?" And to understand their life history strategies within a broader, evolutionary context, Morgan examines the entire life cycle—from larvae to larval settlement and back to adult reproduction—of 400 species

from several families on a number of different coasts, comparing 54 different variables. He admits that achieving this task, although made easier by the wealth of existing data on crab larvae from previous research, is nevertheless a daunting prospect. Still, he chips away at the puzzle a little at a time.

While in Panama at the Smithsonian Tropical Research Institute's marine program in 1987, Morgan began his comparative studies amid the political unrest culminating in the U.S. invasion—general strikes, check-points, and shootings. He scoured the rocky shores trying to learn what was triggering all the crabs of a species living on the Pacific coast of the Isthmus of Panama to reproduce and release larvae in one synchrony, and all the crabs of the same species on the Caribbean coast to be timed in another synchrony.

Since they were all the same species, their internal, or endogenous, clocks should be the same. But these water bodies, although separated by a stretch of land only 60 km wide, have very different tidal regimes. And these different tidal regimes are the key to understanding temporal and spatial differences in hatching patterns for a single species. Morgan would not have found this key had he limited his field studies to crabs all within the same tidal regime, a typical shortcoming in earlier ecological studies.

Morgan concluded from this and other studies along the coasts of the U.S. and Caribbean that at least one of four short-term environmental cycles—daily tides, spring (biweekly) tides, lunar phase, and the day-night cycle—are responsible for setting or resetting internal reproductive clocks of all crabs. "The external cues serve to guide the internal rhythms by phase shifting them to the local tidal environment so they can time their reproduction better," he said.

When the tide rises and covers their burrows, female crabs pump their abdomens vigorously, releasing a cloud of hatching larvae numbering in the thousands to the outgoing tide. The larvae are carried offshore, metamorphose into a postlarval swimming stage, then are pushed back to shore by prevailing winds and currents.

If the young crabs are pushed off course and settle in a place other than where they began life, their internal clocks can be out of phase with the external cycles in the new place. They may exhibit conflicts between their internal clocks and the new external cues, resulting in a phase shifting of their internal clock.

"In one of my field studies," said Morgan, "larvae hatched from a species that typically resides on the eastern U.S. coast with two tides a day, sometimes settle in a section of the Gulf coast with one daily tide. The east coast population follows a rhythm of dispersing larvae biweekly on the Spring high tide at night. But in the Gulf coast location, the only Spring high tide is during the day."

Larvae spawned in daylight are more vulnerable since they are more visible to the many predatory fishes hovering in the shallows. Morgan's research results show that precision in release of larvae is largely a reaction to this predation. "The conflict was resolved by the crabs releasing their larvae on the one daily high tide that is coincident with dawn," he said. "Thus, they are transported from shorelines before fishes resume feeding."

Morgan is also trying to learn what protects the young crabs after release until they return to shore. Discovering the pressures at play at each stage in the life cycle, perhaps a lifelong project, will help him understand how the species survives in a threatening and changing environment. ■

## Teaching Long Island Teachers: Environmental Myth vs Reality

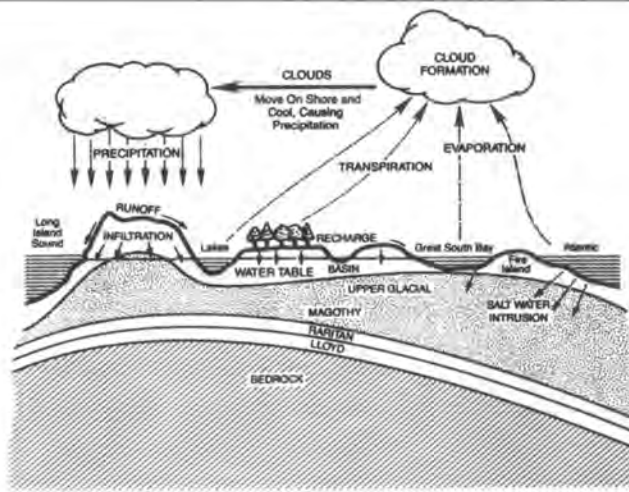
The Marine Sciences Research Center has been heeding the public call for information about the marine environment and related conservation problems to be disseminated into regional schools' science classrooms. One effort to accomplish this has been the MSRC Bulletin subscription series, now sent to over 400 teachers and 200 non-teachers.

Another was a series of science teachers' workshops held in autumn 1991, sponsored by Long Island Lighting Company and MSRC to tailor the New York Science Technology and Society Education Project (STEP) teaching modules to reflect Long Island's particular environment, resources, and waste problems.

In April, a day-long course for in-service credit, "The Long Island Environment: Separating Myth from Reality," gathered Long Island teachers to learn from agency regulators, environmental scientists, and waste management experts about the realities of threats to Long Island's groundwater, its coastal marine environment, handling of solid wastes, and air pollution. The handbook used for the course was the Long Island teachers-STEP-LILCO-MSRC modules.

The one-day course included discussion by agency heads and other experts, such as Long Island regional planner Lee Koppelman, about how much solid waste we produce, what it consists of, how much is recycled, and where it goes when we put it out for pick up; discussions about Long Island's groundwater and potential impacts by development; and causes and effects of hypoxia in Long Island Sound.

The teachers learned, for example, that the aquifer groundwater used for drinking water on Long Island is a closed loop system, and water taken out should equal water put back in. When a population that exceeds carrying capacity removes water permanently by flushing it to the ocean as waste water, a deficit of aquifer water will result, since replacing it from rainfall is a very slow process. ■



The water cycle on Long Island.

### FACULTY NOTES Continued from page 3

tetracycline hydrochloride and a lizarin complexone," were E.D. Houde, L.

G. Morin and D.H. Secor. "A larval mark-recapture experiment to study early life population dynamics and recruitment in striped bass," by D.H. Secor, E.D. Houde, D. M. Monteleone and L. G. Morin, was also presented at this meeting.

Graduate student Rafael Niño, has been awarded a grant from the Sounds Conservancy, Inc. through their program in Marine Conservation Education and Research Projects in the Southern New England marine region. Niño's thesis topic is "Acute toxicity of low dissolved oxygen concentrations for the sheepshead minnow and the opossum shrimp."

Akira Okubo presented an invited talk, "Modelling animal aggregation," at the Gordon Research Conference on mathematical biology held at Tilton School, New Hampshire in June.

Physical oceanographer Hartmut Peters has been awarded two research grants by the Ocean Sciences Division of the National Science Foundation: "Turbulent mixing in stratified tidal flows: direct field measurements and turbulence closure," a three year grant; and with fellow MSRC physical oceanographers Robert Wilson, Kamazima Lwiza, and Malcolm

Bowman, "A high-frequency ADCP for estuarine, coastal, and shelf research."

Charles Wurster attended the June United Nations Conference on Environment and Development ("Earth Summit") in Rio de Janeiro.

Jeannette Yen received two new grants this May: a three-year contract with the Office of Naval Research, Oceanic Biology Division, titled "Sensory perception by zooplankton: fluid mechanoreception by *Euchaeta*, a carnivorous marine copepod," and a one-year grant from NSF's Division of Polar Programs for "Lipids transformations in *Euchaeta antarctica*, a carnivorous marine copepod."

Yen has been invited to speak on mechanoreception in copepods this summer at Shoals Marine Laboratory off the coast of Maine and at the Hopkins Marine Station, Monterey, California.

She has participated in two Office of Naval Research workshops this past spring: one at the Whitney Lab in Florida, on "Olfactory discrimination in marine organisms," and the other at Scripps in San Diego on "Hydrodynamic and near-field acoustic detection."

Yen's graduate student, David Fields, received funding from the Lerner Grey Foundation for his research on copepod feeding currents, and undergraduate honors student Andrew Leising obtained URECA funding to work with Yen on swarming behavior of copepods. ■

### Fine-Tuning Technology to Solve Long Island's Environmental Problems

Over 80 entrepreneurs, scientists, policy makers, and planners from more than 40 different scientific and business organizations came to MSRC on June 19 to a workshop, "Turning Long Island's Sensitive Environment and its Environmental Problems into Opportunities for Entrepreneurs." The goal of the workshop was to search for new technologies or ways to transfer existing technologies to address Long Island's environmental problems. Success in this goal would make Long Island a magnet for high technology companies dedicated to the environment.

All of the keynote speakers—Stony Brook's provost, Tilden Edelman; NY State Senator Kenneth LaValle; and president and CEO of the Long Island Research Institute, Dr. Philip Palmedo—spoke of the rich opportunities here on Long Island for businesses dedicated to environmental upkeep and remediation. "It is time to form fine-tuned links between higher education and business to develop high-technology initiatives to protect our environment," said LaValle, referring to the University and MSRC as two of Long Island's "great intellectual resources."

Long Island planning expert Lee Koppelman said that the Island, with its large diversity of marine and terrestrial environments, is the greatest natural laboratory in the world for developing and testing technologies to monitor, protect, or remediate environmental conditions.

Participants divided into five working groups: municipal solid waste, water quality, air pollution, data and information, and bioremediation—the use of biological organisms to break down pollutants. In these sessions, individuals from industries and scientific institutions exchanged ideas on what was needed, or could be adapted, to solve particular problems.

One positive result of the workshop was pairing groups interested in common problems. At a future stage, another such workshop will bring the participants even closer to actual solutions and opportunities to move ideas out of laboratories and into the market place.

The workshop was co-sponsored by the University at Stony Brook's Regional Development Task Force, the Long Island Research Institute, MSRC, and the Long Island Environmental-Economic Roundtable. ■

A science project by high school student Michael Purdy, completed while a Simons Fellow at MSRC last summer, has recently been given "high honors" by the Long Island Science Congress. The project, directed by MSRC geological oceanographers Henry Bokuniewicz and Roger Flood, is titled, "Sediment distribution in the lower Hudson River estuary." Simons scholarship awards are based on high scholastic achievement and matched interests with professors.

Malcolm Bowman presented a paper, "Dynamic topography and surface fronts near Barbados, West Indies," at the 26th Canadian Meteorological and Oceanographic Society Congress in Quebec City in June.

Monica Bricelj participated at the Marine Phycotoxin Workshop, hosted by the National Marine Fisheries Service, Southeast Fisheries Center, in Charleston, South Carolina April 21-24. This meeting, which included 26 invited participants, was designed to plan and implement a national program on marine phytoplankton toxins and their food web transfer and to develop research priorities for such a national plan.

Jonathan Hare and Teresa Rotunno, graduate students of Robert Cowen, presented papers at the 16th Annual Larval Fish Conference, held at the University of Rhode Island June 16-19.

Rotunno's paper was on species identification and aging of butterfish from the

South and Mid-Atlantic Bights. Hare received the Sally Richardson award for best student paper on the use of mitochondrial DNA techniques to identify the species of larval fish. He has also received a grant from the Lerner-Gray Foundation of the American Museum of Natural History for this work.

Graduate student Francis Juanes received the 1992 Graduate Student Alumni Association Award at ceremonies held in April in the Staller Recital Hall. The award is based on activity in campus affairs and demonstrated activity benefitting the university environment. Juanes, who will receive his Ph.D. in August, has worked on juvenile bluefish ecology under the supervision of David Conover.

Chemical oceanographers Cindy Lee and Kirk Cochran attended the Joint Global Ocean Flux Study steering committee meeting in Boulder, Colorado in June.

Lee attended a meeting of the Scientific Committee for the Protection of the Environment (SCOPE) in Washington, D.C. in April on population growth and land-use change in the Amazon. SCOPE is a committee of the National Academy of Sciences.

John M. Olin Postdoctoral Fellow Doreen Monteleone presented a paper at the 16th Annual Larval Fish Conference in Kingston, Rhode Island in June. Co-authors with Monteleone on the paper titled, "Immersion marking of otoliths of striped bass, *Morone saxatilis*, eggs and larvae using

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*Young visitors painting a mural of how the earth should look in 2010 if we take care of it.*



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demonstrated what they had learned during their visit by completing the Scavenger Hunt questionnaire. And when weary of all the activities, visitors sat and watched continuous videos about the earth, sea and space.

Highlights for the youngsters were the NY Sea Grant exhibits and aquarium, where they could make fish prints and hold live marine animals, such as crabs and starfish, in the touch tank. A pair of large, blank posters and a variety of tempera colors proved tempting for inspired young artists wanting to paint environmental scenes depicting the cared for Earth and one not taken care of.

"Children always have provocative things to say about the environment through their art," said MSRC dean and director J. R. Schubel, who designed this activity. Whatever their statements on the environmental posters, the overwhelming response from children and their parents about their visit to MSRC was positive. "In fact, it was so positive," said Schubel, "that we have promised to make it an annual event." ■

### **Long Island Sound Study Office Opens Officially at MSRC**

A ribbon-cutting ceremony officially opened the U.S. Environmental Protection Agency's Long Island Sound Office at MSRC in May. Keynote speakers were EPA's Region 2 Administrator, Constantine Sidamon-Eristoff, New York State Representative James H. Scheuer, New York State Senator Owen H. Johnson, United States Congressman George Hochbreuckner, and MSRC dean and director J. R. Schubel—all long-term supporters of including the Sound in the National Estuary Program.

The office, under the direction of EPA's Mark A. Tedesco, will play a central role in coordinating the joint federal, state, and local effort to clean up the Sound, according to recommendations contained in the 500-page Comprehensive Conservation and Management Plan. The office will also serve as the repository for public access to this document, as well as conducting outreach activities with the aid of New York Sea Grant, also located at Stony Brook.

The main headquarters in Stamford will be coordinating efforts to implement recommendations from the study. A number of MSRC scientists conducted field research over the five-year term of the study. ■

*(From left) MSRC dean and director J.R. Schubel and EPA's Region 2 Administrator, Constantine Sidamon-Eristoff at the Long Island Sound Study Office ribbon-cutting ceremony in May.*



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