Marine Sciences Research Center

NEWSLETTER

Vol. 5 No. 1 Winter 1994

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25 top scientists converge for 25th Anniversary

Coastal Ocean Summit

Renowned scientists from around the world debated the most pressing threats to the global oceans in December at MSRC's Coastal Summit. The scientists determined that the main threats to the coastal oceans were nutrient pollution, chemical contamination, fresh water diversion, overfishing, and microbial contamination. The following points were made at the Summit, held in celebration of the Center's 25th anniversary:

- The world's coastal oceans are experiencing widespread, unprecedented changes as a result of the direct and indirect effects of human activities.

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Environmental war room tested at Coastal Summit

Scientists attending the MSRC's December Coastal Summit had an opportunity to use tomorrow's technology to get their ideas across in an environmental debate. This technology is the computerized Environmental War Room, an adaptation of "situations rooms" used in making military and business decisions, but which employs specific software that has never been used before for a marine environmental application.

The concept relies on individual computer screens and keyboards that allow anonymous input from participants. Each person's input is channeled into one main computer.

At this point, a facilitator assembles all the entries, compiles the information or data, and chooses a way to illustrate it as a collection of individual entries, a composite, or graph on one large screen without identifying any of the authors. This allows everyone to freely enter and read responses without bias.

Since the Summit, a number of agencies have called to express an interest in using this technology in settings where in the past, agreeing on a set of plans or principles has been a long and tedious, and sometimes contentious, process. ■

Coastal Ocean Summit scientists entered their ideas on networked computers in the new "Environmental War Room."

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- While some of these impacts have been controlled, and in a few cases reversed, in the developed world, they pose a large and growing hazard to coastal environments of many developing countries.

- In geographic scope and in global consequences, worldwide coastal marine environments are already being lost as rapidly as the world's tropical rain forests, which portends losses in the stability and biodiversity of one of the world's most productive ecosystems.

The summary from the Summit, further states that unless these loomings are checked quickly and effectively, they could trigger major and irreversible losses of rich and diverse coastal resources in countries where population is growing exponentially. They would also have major negative impacts in many vulnerable areas, such as those in tropical and sub-tropical regions where coastal biodiversity is greatest and where natural and human-related stresses have been largely absent in the past.

The group developed a set of recommendations that universities and academic institutions might take to make advances in solving some of the coastal problems. Sustained basic research is essential, but participants realized that they also needed to demonstrate the power of knowledge and technology in solving coastal problems. And this could be accomplished through effective communication and collaborative partnerships with government, industry, the media, and advocacy groups, such as exchanging joint appointments among academic scientists, government scientists, and managers. ■

GEMS and WISE MSRC mentors

More attention is being paid recently to the difference between the ways boys and girls learn science and mathematics. A startling number of young women who are strong in math or science and declare either as majors in their freshmen year, subsequently drop these majors. These facts about college freshmen and the observed general lack of interest in science or math on the part of girls in elementary and secondary schools have common origins: a female's lack of competition and avoidance of hostility, especially when in mixed gender classes.

To counteract these negative effects and to combat the high attrition seen at the college level, Stony Brook has adopted the WISE (Women in Science and Mathematics Excel) program. The goals of this program are to foster a helpful environment rather than a competitive or hostile one for learning science and math. For example, a special calculus class now emphasizes cooperativity and computer aided lessons. MSRC faculty members Darcy Lonsdale, Jeannette Yen, Daniel Conley, and Mary Scranton are active in the program, and plan to either take young women into their labs as researchers or teach them in introductory courses for first-year students.

◀ Marine ecologist, Darcy Lonsdale aids visiting undergraduate Kim Charlie on a summer science project.

Because of their interest in promoting and mentoring women scientists, Lonsdale, Scranton, and Josephine Aller have recently been called upon by the GEMS (Girls Exploring Math and Science) program, sponsored by the University at Stony Brook, and coordinated by Ward Melville High's Melanie Krieger and Port Jefferson's Linda Padwa. For this program a class of girls visited the laboratories of the three MSRC scientists in January to meet women scientists and to learn about what they do—all ultimately intended to foster a sense of science as a female friendly career choice. ■

Sciences, University of Washington in Seattle; at the School of Atmospheric Sciences, University of Victoria, British Columbia; at Pacific Northwest Laboratories, in Richland, Washington; at NASA Langley Research Center, Hampton, Virginia; and at Los Alamos National Laboratory, Los Alamos, New Mexico.

David Conover has received a National Science Foundation grant for Countergradient variation; adaptation to seasonality in fishes.

Graduate student **Jeff Buckel** gave a presentation, co-authored with Conover, titled, "Diel movements and foraging patterns of juvenile bluefish, *Pomatomus saltatrix*, in the Hudson River estuary," at the Estuarine Research Federation 12th Biennial Conference in November at Hilton Head, South Carolina. Also at this conference, **Nancy Steinberg** presented a paper coauthored with Conover titled, "A bioenergetic determination of young-of-the-year bluefish consumption in the Hudson River estuary."

Postdoctoral fellow **Magali Gerino** presented an abstract and poster coauthored with **Robert Aller**, **Josephine Aller**, **Kirk Cochran**, **Mark Green**, **David Hirschberg**, and **Cindy Lee**, titled, "Changes in bioturbation mode during a phytoplankton bloom," at the 1994 Ocean Sciences Meeting in February at San Diego.

Gerino also presented an abstract, coauthored with Mark Green, Robert Aller, Josephine Aller, and Cindy Lee, titled, "The benthic response to a carbon input during the spring bloom in Long Island Sound (the PULSE Project), at the 1994 Marine Benthic Ecology Meeting in March in Mystic, Colorado.

Cindy Lee and graduate student **Silvio Pantoja** are participating in the "Thioploca cruise" in the upwelling region off the Chilean coast March 6 through April 1. The project is organized by the Max Planck Institute for Marine Microbiology in Bremen, Germany in collaboration with the University of Concepción in Chile. Lee and Pantoja will study organic geochemistry aspects of the project, which will investigate the upwelling ecosystem associated with mats of a whitish-yellow bacteria *(Thioploca)*. The mats are several centimeters long, cover the sediment surface between northern Peru and southern Chile, and are thought to play an important role in recycling sedimentary organic matter and in the settling of larvae of economically important resources.

Akira Okubo attended a workshop on "Individual based modeling for animal aggregations," sponsored by ONR-URIP in January at the Rosenstiel School of Marine and Atmospheric Sciences of the University of Miami.

Hartmut Peters received a Brookhaven National Laboratory award for a five-month traineeship for **Yi-Chao Wu** for "Accurate measurements of the sea surface temperature from satellite infrared radiometers."

Eric Schultz and **David Conover** received a Research Experience for Undergraduates Award as a supplement to their NSF grant on "Adaptive responses to seasonality in the Atlantic silverside, *Menidia menidia*."

R. L. Swanson received an award from Rolite, Inc. for "Cooperative ash evaluation and demonstration program."

Gordon Taylor participated in a Sea Grant-sponsored workshop, "Marine Biotechnology in the Northeast," at Massachusetts Institute of Technology in Cambridge, Massachusetts in December. Also in December, he gave a presentation at the LILCO Technical Showcase entitled, "Countermeasures to marine biofouling," in Hauppauge, Long Island.

Xintai Wang attended the 4th Annual Great Lakes Research Consortium Student-Faculty Conference held at SUNY at Syracuse in January. Wang gave a talk on part of the research done with advisor **Roger Flood**: "Seasonal resuspension of contaminated sediments in Lake Ontario."

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MSRC Alumnus, National Geographic Researcher to Lecture on "'Crittercam': Filming the Secret Lives of Aquatic Animals"

On Tuesday, April 26, Greg Marshall will return to the turf of his graduate days at MSRC (class of '88) to give a public lecture at Theater Three in Port Jefferson Village about his work, remotely attaching mini-cameras to aquatic animals such as turtles, crocodiles, and seals. The video gives the scientists a view from the animal's back or belly, allowing them to learn the secrets of the animal's behavior once it swims out of sight.

This past summer, Marshall was featured in a 30-minute National Geographic "Explorer" program entitled, "Crittercam," about this work. He has just wound up a two-month sojourn in the waters of South Africa, working with National Geographic to attach mini-cameras to great white sharks to learn how they move through the water and how they approach their food.

The lecture, which is co-sponsored by the MSRC and Port Jefferson Village Chamber of Commerce, is scheduled for 7:00 p.m. with reception to follow.

Call 632-8676 for further information.

FACULTY AND ALUMNI NOTES

Debugging global climate models

(excerpted from an article by Sue Risoli in the University at Stony Brook's newsletter, Currents*)*

An international team of climate scientists led by University at Stony Brook professor **Dr. Robert Cess**, has spotted one of the most troublesome "bugs" in computer models used worldwide to project long-term global climate changes: the simulations inaccurately measure carbon dioxide concentrations that worsen the "greenhouse effect." The result? Unreliable climate scenarios. The team's findings were published in a recent issue of *Science*. The work is part of a Department of Energy-sponsored project headed by Dr. Cess to compare and improve global climate forecasting. Next: a study on how well computer models calculate seasonal changes in the Earth's cloud cover.

New York Sea Grant sends two more MSRC graduates to DC

Congratulations to MSRC graduate students **Rob Cho** and **Elizabeth Lamoureaux** , the 1994 Dean John A. Knauss Marine Policy Fellows. Knauss Fellowships, administered by National Sea Grant College, provide support for one year's work experience in the executive or legislative branches of the Federal government. Over the past three years, New York Sea Grant has sent five MSRC students to work in Washington DC in this program.

Cho, who did his graduate work with Bob Cowen will now be working for Representative (D., California) Dan Hamburg, and Lamoureaux, who worked with Bruce Brownawell, will work with the U.S. Fish and Wildlife Service's Division of Environmental Contaminants.

Jonathen Jed Brown, MSRC's 1993 Knauss Fellow, is currently working on Merchant Marine and Fisheries Committee matters for New Jersey Congressman Frank Pallone, Jr. Previous Knauss Fellows from MSRC were **Cynthia Decker** and **Sanjay Gupta** in 1992 and **Susan Sponaugle** in 1989.

James Brister attended the WAS/ World Aquaculture EXPO VII in New Orleans in January.

Ed Capenter has received a two-year continuation NSF grant, "Physiology, ecology, and bio-chemistry of nitrogen fixation by marine planktonic microorganisms."

Bob Cess gave a seminar titled, "Cloud-radiative Feedback in General Circulation Models," in December at Lawrence Livermore National Laboratory in California. He gave an invited paper, "Observational Test for Cloud-Climate Feedback in GCMs" at the 8th Conference on Atmospheric Radiation in Nashville in January.

He also spoke on "The Earth's Surface Energy Budget: Importance of Shortwave Radiation by Clouds," at the Department of Atmospheric Sciences, Oregon State University in Corvallis in January; and in February at the Department of Atmospheric

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1994 Sea Coasts Sunday Breakfast Series

Sundays,10 am - 12 pm
120 Endeavour Hall
Marine Sciences Research Center

April 17
Environmental Health and Human Health

Are they connected? What's the evidence on Long Island and what should we do about it?

April 24
New Perspectives on Wastewater Management

Where does it go when it leaves residential drain pipes? Have things changed over the past 50 - 100 years? Are we flushing our future away?

Admission charge of ***$10.00 per person*** *or* ***$15.00 for two*** *($5.00 per person, MSRC Associates); includes breakfast.*

Limited space available,
pre-registration required.
Call the Director's Office
(516) 632-8700 to register.

New Coastal Marine Scholar

Welcome to Geoffrey Trager, who has just arrived on the scene from a postdoctoral fellowship at the H. Steinitz Marine Biology Laboratory of the Interuniversity of Eliat in Israel, where he has been working on biofluid mechanics, the study of the

interaction between fluid physics and biology. He is MSRC's newest Coastal Ocean Scholar.

Trager, who hails from Washington, D.C., completed his B.S. from the University of California at Santa Barbara, his M.S. at the University of Southern California and his Ph.D. in Biology from Boston University. His research interests have focused on the interaction between water flow and the feeding behavior of benthic crustaceans. Sometime this year, he will be one of three scientists featured in an"American Scientific Frontiers" program, part of a series broadcast on PBS. In his segment, Trager discusses his "dancing barnacles," and illustrates how they feed with variable water flow. ■

Scientists from Apulia region of Italy to work with Waste Management Institute

The first collaborative effort to come out of a continuing scientific exchange among MSRC, SUNY Farmingdale, and environmental ministers and scientists in the Apulia (southeastern) region of Italy, began with the arrival of Italian postdoctoral fellows Raffaello Iavagnilio and Alfieri Pollice at the end of January. The two researchers will be working with Frank Roethel, Larry Swanson, Henry Bokuniewicz, Bruce Brownawell, Vince Breslin, and Sheldon Reaven on two solid waste management projects that may prove beneficial for both New York and Apulia.

The team will be looking at the quality of ash resulting from different municipal solid waste incineration technologies and also examining technologies for stabilizing contaminated dredge material, both problems of concern in New York and the Apulia region of Italy. The two post-doctoral fellows will be at MSRC from six months to a year, and hope to start a demonstration program for stabilizing contaminated sediments during their stay. ■

Minghua Zhang

Perfecting a global climate model

Solar radiation is the engine that drives the Earth's climate in a pathway of physical changes accompanied by a series of heat gains and losses along the way. At the same time that solar radiation warms the planet's surface, it also vaporizes water, offsetting heat gain through evaporative cooling. The water vapor rises into the cooler troposphere, where most of the weather and climate changes occur—from the Earth's surface to 14 km above— and condenses to form clouds, which releases heat.

Clouds also reduce heating of the Earth's surface by reflecting solar (shortwave) radiation. On the other hand, they contribute to greenhouse warming, as does carbon dioxide (CO_2), by blocking longwave radiation returning to space from the Earth's surface.

Atmospheric scientists like MSRC's Minghua Zhang know that systematic changes in cloud cover—any increase or decrease in clouds or the droplets they contain—would make a very big difference to the overall global climate. But they also know that much remains to be understood about cloud formation and their role in absorbing or dissipating heat.

The many heat losses and gains generate temperature gradients between warmer and cooler parts of the trophosphere, and these temperature gradients cause pressure gradients, which in turn, drive the atmospheric circulation. The atmospheric circulation is so strong that it can circle around the globe once every two to three days. It transports water vapor from one place to another, forming clouds.

Atmospheric scientists must, therefore, account for couplings, or interactions, between each part of the globe with every other part, and they must consider couplings between the atmosphere and surface features of the Earth, between the atmosphere and the oceans, and between the atmosphere and the biosphere to piece the global climate puzzle together.

To study possible future climate changes resulting from human activities, atmospheric scientists like Zhang use numerical models to simulate the global climate. These models are very long programs, constructed from the physical laws and observational information such as weather data sets from all over the world, and are run by supercomputers. The model Zhang uses was originally developed by the National Center for Atmospheric Researchers (NCAR). It contains more than 100,000 grid points, representing points several hundred kilometers apart all over the globe and extending 40 km into the upper atmosphere. Parameters such as wind speed and direction, pressure, temperature, water vapor, radiation, evaporation, clouds, rain, and snow are calculated for each grid point.

At his workstation, Zhang tries to improve on the model by reducing some of the many uncertainties it contains and to account for misfits between calculations and observed climate. His recent research focus is to look at how the upper tropospheric water vapor, temperature, and clouds respond to climate change, in particular, global warming. Scientists know that in the current climate, the greenhouse effect from high clouds is much greater than the cooling effect resulting from reflected solar radiation. But with a doubling of CO_2, which may be realized in the future*, the atmosphere becomes warmer. Zhang ponders how these high clouds would change under these conditions: "The potential impact of high cloud change on the Earth's energy budget could exceed the direct forcing from a doubling of CO_2. Also, the water vapor greenhouse effect will become stronger when CO_2 increases because more moisture will be in the atmosphere."

Zhang's current research focus is based on the discovery that water vapor feedback in the upper troposphere is closely associated with cumulus convection that results from an unstable atmosphere. Through cumulus convection, air from the lower atmosphere can be lifted very fast in a funnel or pump-like manner, transporting water vapor (heat-producing) and surface heat (heat-removing) into the upper atmosphere.In a warmer climate, convection becomes stronger. More moisture and more heat are pumped into the upper troposphere, and this extra moisture and heat produce a delicate change in the relative humidity, which controls high clouds.

"We have learned that the cumulus convection is quite important—that three feedback mechanisms are associated with it," said Zhang, one of the investigators on this Department of Energy-funded project, along with MSRC's Bob Cess and other scientists from NCAR. "Several cumulus convection schemes are currently used by different scientific groups in the world, and we know they alone can produce different effects. Which is better or right? This is the question we hope to answer."

In a current effort to compare the model simulation against data, Zhang and his colleagues are investigating the observed atmospheric response to seasonal variation in solar radiation by combining several existing radiation and weather data sets with a new data set from NASA. The prospects to yield answers look promising, as they continue the challenge to make global climate models more accurate.

**The current increase in CO_2 in the atmosphere is 32% over pre-Industrial Revolution measurements.*