



AT SEA

The University of Delaware
Graduate College of Marine Studies
Newsletter

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Economics Meets the Delaware Beach

by Kari Gulbrandsen

Delaware's beaches shelter a variety of marine life, from horseshoe crabs to endangered piping plovers. They protect the mainland from storms. And they attract visitors like a magnet. Over 5 million people visit the Delaware coast each year. That's more than seven times the state's population.

As coastal development continues, questions arise about beach management. For example, do we continue the current policy of beach nourishment or do we allow the beaches to migrate inland naturally as the sea level rises? And who should pay to protect and maintain the beaches?

Here at the Graduate College of Marine Studies (CMS), George Parsons, associate professor of marine policy and economics, is working on these and other questions concerning the economics of beaches.

Economic Value of a Beach

The economic value of an item that is sold in a store can be determined by how much money you are willing to pay for it. But you can't just walk into a store and buy a beach. How then do we determine the economic value of a beach in dollars and cents?

"When you buy an item in a store, you have made a conscious choice between that item and your money," says Parsons. "Economic value can be measured in terms of the choices an individual makes. There is real economic value if an individual is willing to give up another activity and devote their recreational or leisure time in going to the beach," he notes.

In a project funded by the University's Sea Grant College Program a few years ago, Parsons and Ted Tomasi, an adjunct faculty member at CMS, used a random utility model to assess the economic value of a beach.

This model will predict the economic value of a beach as a function of the number of people who visit that beach. The characteristics of a beach (e.g., its length and width) and the characteristics of individuals (in this first case, their travel cost to a beach) were used to predict how often an individual was likely to visit a particular beach in a day trip. The random utility model also revealed how important the different characteristics of a beach are to an individual.

Parsons and Tomasi, with Matt Massey, Ph.D. student in economics, initially surveyed the characteristics of 62 beaches in the Mid-Atlantic region according to such things as availability of parking, beach length and width, and the presence of a boardwalk and other amusements.

A random sample of approximately 600 Delaware residents was then asked which beaches they had visited over a year. As would be expected, Parsons and Tomasi found that if a beach had good parking and a boardwalk, park, or other amusements, then it would have a high probability that it would be visited. In contrast, limited access and a beach that was too wide or narrow decreased the probability that it would be visited.

Although 62 beaches were studied, Parsons notes that "not all of these beaches will be in a person's 'choice set' or the actual set of beaches that an individual will choose from." Individual factors such as income, free time, beach familiarity, and distance from the beach will determine the choice set for each person. By taking an individual's actual



Robert Cohen

Professors George Parsons (standing) and Robert Dalrymple (seated) are studying the economic implications of beach nourishment versus beach retreat.

choice set into account, Parsons found that the prediction of which beach a person would visit was improved.

Massey, under the guidance of Parsons, is now expanding the analysis to address how other characteristics of an individual, such as age and income, will influence the choice of which beach to visit. This analysis will improve the prediction of which beach will be visited.

Estimates of the economic value of Delaware beaches provide valuable information for policy makers, according to Parsons. "These estimates can be used to predict the decrease in the economic value of a beach due to erosion or closure from an event such as an oil spill or, likewise, an increase in the value of a beach from nourishment projects," he says.

(Continued on page 3)



At the Helm

While you might think that academic institutions throttle down to a much slower speed during the summer, that's not the case here at the Graduate College of Marine Studies (CMS).

During the past several weeks, you may have seen or heard about our faculty and students working in oceans, bays, and marshes close to home and around the world. Our research efforts continue to span the ocean science and policy spectrum, from developing a molecular probe to rapidly detect toxic *Pfiesteria*, to participating in national policy studies and debates about how the United States should govern the ocean at our shores.

And these CMS research efforts represent only the "tip of the iceberg," as new faculty member Adam Marsh might note. Dr. Marsh, who has conducted research in Antarctica for a few months a year for the past seven years, recently joined CMS as an assistant professor in our Marine Biology-Biochemistry Program. He has an intense interest in the metabolic processes of organisms living in "extreme" or demanding environments, from the ocean waters off Antarctica to Delaware Bay.

Here at CMS, we have a strong commitment to excellence in marine research and education. And it is thanks in large part to generous friends who hold a fascination for

the sea, and an appreciation for the benefits of ocean science, that we have been able to achieve many significant goals since the college was founded in 1970.

The college's roots actually extend to 1950 when a group of local fishermen, alarmed by a drastic decline in Delaware Bay fisheries, approached the Delaware General Assembly for help. The fishermen believed the University of Delaware could come to their aid, and the 116th session of the General Assembly responded by allocating \$30,000 to set up a marine biology program in the University's Department of Biological Sciences.

From this seed, our college eventually was born, but not without the great effort and dedication of a close-knit team of researchers including Joanne Currier Daiber, the first female marine scientist hired by the University in 1951.

Mrs. Daiber tells with humor and grace the demanding conditions under which our first marine scientists worked in her portion of *Salty Memoirs: Adventures in Marine Science*, a two-volume edition that will be available soon from CMS.

Her recollections are entitled *Views from the Distaff Side*, while the companion volume, *Birth Pangs and Growing Pains*, was written by the marine scientist she met here in 1952 and later married, Franklin C. Daiber, who is now a CMS professor emeritus.

Dr. Daiber recently established a fellowship in recognition of his wife's pioneering work in marine science. The Joanne Currier Daiber Fellowship will be awarded annually to a female graduate student in our Marine Biology-Biochemistry Program.



Bob Bowden

As you read this issue of *At Sea*, you'll see other examples of the kinds of contributions you, our friends, have made to us, the inspiration behind some of these gifts, and the impact this generosity has had on our students and on our research and educational endeavors.

Your contributions have helped us grow in important ways, from building our first research vessel to adding laboratories, scientific equipment, and endowed professorships. The scholarships and awards you have funded have helped honor meritorious students as they travel the path to discovery as the next generation of marine scientists.

As we grow into the future, we acknowledge, with gratitude, the powerful role that individuals from all walks of life can play in advancing ocean research and education for the common good.

Dr. Carolyn A. Thoroughgood
Dean, Graduate College of Marine Studies



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WELCOME ABOARD

This edition of *At Sea* introduces you to our new writer/editor, Kari Gulbrandsen. She recently joined CMS's Marine Communications Office as a marine outreach specialist. In addition to the *At Sea* newsletter, she'll be working on a variety of other projects, from scripts for the *SeaTalk* radio series to press releases and educational exhibits.

Gulbrandsen brings a strong science background and a diversity of editorial experience to CMS. She has a B.S. in geophysics from Lehigh University and an M.S. in material science, along with a certificate in technical writing, from the University of Delaware. For the past two years, she served as a technical writer for both the International Centre of Diffraction Data and the Center of Technology Transfer at the University of Pennsylvania. Prior to her positions there, she was the newsletter editor for the Science Alliance of Delaware, a non-profit organization dedicated to enhancing science education in grades K-12.



Jack Buxbaum

Kari Gulbrandsen

Economics

(Continued from page 1)

Beach Nourishment vs. Retreat

In areas where residential and commercial structures are built on the beach, valuable beachfront is lost as the sea level rises. The state of Delaware spends between one million and two million dollars every year to renourish the beaches with sand to prevent this loss. This cost, as with everything else, is likely to increase.

Another alternative is to allow the beaches to migrate inland naturally. From an economic perspective, nourishment and retreat are both costly. But what policy will be the least costly for a community?

Parsons and Robert Dalrymple, E. C. Davis Professor of Civil and Environmental Engineering at the University of Delaware, are estimating the costs that are involved in both beach nourishment and beach retreat in a joint project funded by the University's Sea Grant College Program.

Bob Bowden



Delaware currently spends from one million to two million dollars a year to replenish beaches with sand.

The primary cost in a policy of beach nourishment is that of the sand. Parsons is using historic cost data and price trends to predict the future cost of the sand while Dalrymple is using ocean engineering models to estimate the actual volume of sand that will be needed. Both estimates can then be used to estimate the actual cost involved in renourishing beaches.

A policy of beach retreat would primarily involve the loss of residential homes. Parsons and Jeff Wakefield, Ph.D. student in economics, use erosion rates to estimate the number of homes that may be lost in the next 100 years.

Although it is tempting to use the market price of these homes as a measure of the economic loss, a portion of the market price of a home in a coastal community actually is dependent on its proximity to the beach. "That value is never lost to the community," Parsons says. "It is simply shifted to the next house."

Parsons is using actual real estate transactions, along with house characteristics, to estimate the portion of the purchase price that can be attributed to each characteristic, including proximity to the beach. The resulting increase in the value of the home can then be removed to determine its real economic value.

These estimates will help communities and the state decide whether a policy of beach retreat or beach nourishment will be the most cost-effective.

Economic Policies

Parsons also is reviewing established economic policies to analyze the effect they have had on coastal areas. In one study, he and Heather Daniel, M.S. graduate in marine policy, studied the impact of the Coastal Barriers Resources Act (CBRA) in an area that had both CBRA and non-CBRA-designated areas.

The CBRA legislation was enacted to minimize beachfront development by prohibiting the issuance of any new flood insurance policies by FEMA (the Federal Emergency Management Agency) on undeveloped coastal barriers on or after October 1, 1983.

The researchers found that the CBRA legislation had little effect on the housing market as measured by density and pace of development and value of housing.

However, residents in CBRA-designated areas paid insurance premiums that were three times higher than those in non-CBRA areas. This suggests that these residents may be forced to face the real risk of living on the coast. As a result, taxpayers are likely to save money by having less property to subsidize.

Parsons also has proposed an innovative taxing policy that will help defray the cost of beach nourishment projects. Parsons and Joelle Noalliy, master's student in economics, designed a value-capital tax that would require the people who live closest to the beach to pay more. Parsons hopes to expand this study to encompass the entire Delaware coast.

Conclusions

"All too often economics is ignored in the formation of coastal policy," Parsons says. "This may lead to a misuse of society's scarce resources." Perhaps economic analysis will begin to make its way into coastal policy with efforts like these led by Parsons and other economists.

In Memoriam

The University of Delaware and CMS mourn the loss of a dedicated colleague and friend, Professor Ronald J. Gibbs, who died in May after a brief illness.



Professor Gibbs joined CMS in 1974 after earning his doctorate in oceanography from the Scripps Institution of Oceanography. He also held a bachelor's degree in business administration and a master's degree in geological sciences from Northwestern University.

While at CMS, he taught more than 6 courses, advised over 50 students, and left a legacy of research in waters ranging from the Hudson River to the coral reefs of Belize.

His research on the particle size and composition of suspended sediments in rivers led to studies of the chemical mechanisms that affect these particles once they enter estuaries and oceans. CMS established the Center for Colloidal Science in 1981 to foster additional research on fine particles, and Gibbs served as its director until his death.

In recent years, Gibbs focused on the physical principles that govern the deposition of small particles delivered by rivers into the ocean. This research has contributed to a better understanding of delta formation and will help solve problems associated with the sedimentation of channels and harbors.

His studies of sediment transport in the Hudson River showed that toxic metals and organic compounds are carried on fine-grained particles into the Hudson River Estuary, advancing greater understanding of where these pollutants originate, where they are deposited, and their eventual fate.

Additionally, his research on sediments and nutrients discharged by the Belizean River will contribute to the formulation of management plans to protect the Belize Barrier Reef.

Professor Gibbs's legacy and his affinity with the sea will live on in his students and colleagues at CMS.

Joanne Currier Daiber and the Early Days of UD Marine Research

Stalling out in the middle of the shipping channel while crossing the Delaware Bay in the *Acartia*, the University's first research vessel, was just one of the memories that Mrs. Joanne Currier Daiber shared with students and faculty as the guest speaker at Honors Day. Mrs. Daiber has the unique distinction of being the first female marine scientist hired by the University.

The University established a marine laboratory in 1951 to address concerns about the state's declining fisheries. Mrs. Daiber was one of the original group of five marine scientists who constituted the fledgling laboratory's staff. L. Eugene Cronin was director of this close-knit group, and Mrs. Daiber recollected, "None of the early research could have been completed without the support of every warm body in the laboratory."

Mrs. Daiber met her husband, Franklin C. Daiber, now a CMS professor emeritus, when he joined the group the following year in 1952.

Mrs. Daiber's love for CMS and her work was reflected throughout her talk as she described what it was like in the beginning years of the college. "It was hard to sleep in the warm, stuffy room, and I didn't have the money to buy even the smallest of fans. I missed the luxury of a refreshing shower, but I loved my job."

Although there were long hours and the equipment was often not the best, she spoke with wit and humor — portraying the 40-foot ship *Acartia* as a "hard ship." With tongue-in-cheek, Mrs. Daiber told how her father took out an insurance policy that placed her in the highest bracket — that of deep-sea fishermen. Although this may not have been necessary, as she looked

"back some forty-five years, I could not recall any life jackets on board and I am sure that there was no inflatable raft."

CMS is grateful to Dr. and Mrs. Daiber for reminding us of the many efforts that went into building the college into what it is today.

CMS would also like to thank Dr. Daiber for the generous contribution he made in recognition of his wife's pioneering work in marine science in the early 1950s. The Joanne Currier Daiber Fellowship will be awarded annually to a female graduate student matriculated in the Marine Biology-Biochemistry Program.

At sea in the early 1950s, Joanne Currier is shown working with a bathythermograph, an instrument that measures water temperature as a function of depth. (Courtesy of the Daiber Collection)



Bob Bowden

The development of CMS from its crude beginnings in 1950 to the creation of a four-program, interdisciplinary graduate college in 1970 is told in a two-volume edition — Salty Memoirs: Adventures in Marine Science. The two volumes, Views from the Distaff Side by Joanne Currier Daiber and Birth Pangs and Growing Pains by Franklin C. Daiber, are filled with memories and anecdotes. It will be a treasured remembrance of days gone by as the University celebrates its fiftieth year in the history of the marine program and its thirtieth year as a graduate college. The two-volume edition will be available from CMS this fall.

Student Scholars Recognized at Honors Day

Student accomplishments for the past academic year were recognized at the annual CMS Honors Day ceremonies held in Lewes on May 5. Dean Carolyn A. Thoroughgood presided over the ceremonies and, along with associate dean Nancy M. Targett, presented awards to the recipients. Mrs. Joanne Currier Daiber, the first female scientist hired by the University, was the guest speaker.

Alison R. Sipe, M.S. graduate in marine biology-biochemistry, received the E. Sam Fitz Award, recognizing the student who has displayed the greatest aptitude for professional development in the field of marine studies.

Frances Severance Academic Council Awards for the best thesis or dissertation within a program area were awarded to **Sandra M. Schwalm**, thesis in marine biology-biochemistry; **Porter Hoagland III**, dissertation in marine policy; and **David T. Ruppel**, thesis in oceanography. **Evelia Rivera-Arriaga**, Ph.D. student, received the Center for the Study of Marine Policy Award for the best research paper by a student in marine policy. **Lexia M. Valdes**, Ph.D. student in marine biology-biochemistry, received the Thomas H. Hinkle Award in recognition of her research on Delaware's Inland Bays.

Publications Awards went to **Susan A. Welch**, Ph.D. graduate in oceanography, for "The Effect of Microbial Glucose Metabolism on Bytownite Feldspar Dissolution Rates Between 5° and 35°C," co-authored by Dr. William J. Ullman, and published in *Geochimica et Cosmochimica Acta*; and **Timothy E. Proseus**, M.S. graduate in marine biology-biochemistry, for "Separating Growth from Elastic Deformation During Cell Enlargement," co-authored by Drs. Joseph Ortega and John S. Boyer, and published in *Plant Physiology*.

Katherine A. Bouton, Ph.D. graduate in marine policy, received the Marvin B. Sussman Prize, presented to a Ph.D. graduate of the School of Urban Affairs and Public Policy whose dissertation is judged to be the most outstanding in its theoretical formulation or empiricism. **Ursula A. Howson**, Ph.D. student in marine biology-biochemistry, received an award for the best student presentation from the Mid-Atlantic Chapter of the American Fisheries Society for a paper co-authored





Robert Cohen

Alison Sipe, recipient of the E. Sam Fitz Award, is shown with her adviser, Craig Cary.

by Dr. Timothy E. Targett, titled "Ecology of Summer and Southern Flounder in the South Atlantic Bight."

Marian R. Okie Fellowships were awarded to **Magdalena D. Anguelova**, Ph.D. student in oceanography; **Kevin L. Stierhoff**, master's student in marine biology-biochemistry; and **Andrea L. Geiger**, incoming master's student in marine policy. **Nicole B. Lopanik**, Ph.D. student in marine biology-biochemistry, received the Dr. Paul R. Austin Sea Grant Student Fellowship. **Gerhard F. Kuska**, master's student in marine policy, received the Gerald and Frances L. Bow Fellowship.

CMS Program Fellowships were awarded to the following master's students: **Christine A. Calverley**, marine policy; **Katherine M. Achilles**, oceanography, and **Elias J. Hunter**, physical ocean science and engineering.

Robin M. Tyler, Ph.D. student in marine biology-biochemistry, received a University Tuition Scholarship. University Competitive Fellowships were presented to **Christine A. Calverley** and

Michael M. Whitney, Ph.D. student in oceanography. **Michael B. Jones** and **Lexia M. Valdes**, Ph.D. students in marine biology-biochemistry, were awarded President's Fellowships for academic and research accomplishments.

National Science Foundation Graduate Research Traineeships/Fellowships in Coastal Oceanography were awarded to master's students **Olivia A. Hauser**, **Alexander E. Parker**, **Allison Y. Beau regard**, **Linda C. Popels**, and **Frances M. Pustizzi**, and **Benjamin R. Wheeler II**; and Ph.D. students **Maria G. Honeycutt**, **Cecily C. Natunewicz**, **Matthew C. Schwartz**, **Carol D. Janzen**, **Michael M. Whitney**, and **Susan Park**.

Many students received special recognition from various organizations. **Alison R. Sipe** and **Kirstin M. Ferrari**, master's student in marine biology-biochemistry, received awards for research excellence in the Delaware Sea Grant College Program. **Maria G. Honeycutt** received a Mitigation Directorate Award from the Federal Emergency Management Agency for contributions above and beyond the call of duty on the Hurricane George field damage assessment and Building Assessment Team Report. **Nicole B. Lopanik** received a research award from Sigma Xi, the Scientific Research Society, to fund her study of the tropical sponge *Callyspongia vaginalis*.

Carrie Y. Kopin, master's student in marine biology-biochemistry, was named a NOAA graduate research fellow in the National Estuarine Research Reserve Fellowship Program. **Susan Park** was selected as a participant for the 2000 Summer Institute in Korea by the Korea Science and Engineering Foundation. **Ursula A. Howson** was awarded a National Research Council Fellowship for postdoctoral work at the Northeast Fisheries Science Center, National Marine Fisheries Service Laboratory, in Sandy Hook, New Jersey.

The Benefit of Fellowships

The generosity of its many benefactors has enabled CMS to attract the best and brightest students to its programs. Privately endowed fellowships help our graduate students defray tuition and living expenses so they can concentrate on their studies rather than pursue other means of support.



Robert Cohen

Cecily Natunewicz

In 1987, Mrs. Isabel Faucett Okie established the Marian R. Okie Fellowship in remembrance of her only granddaughter. Awarded on the basis of academic and research excellence and demonstrated leadership abilities, it now has been presented to 17 students.

Cecily Natunewicz, Ph.D. student in oceanography, received the fellowship in 1998 to support her research on the transport of blue crab larvae in coastal waters.

"Ever since I was five, I knew I wanted to be a marine biologist," says Natunewicz. "The Okie Fellowship allowed me to continue my research uninterrupted." Her work will help reveal the role that physical processes, such as wind and currents, play in the blue crab fishery.

Natunewicz will graduate from CMS this winter. Then thanks to a National Research Council Fellowship, she will begin postdoctoral studies at the National Marine Fisheries Service Lab in Beaufort, North Carolina.

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Surf Fishermen Provide Annual Scholarship

Recently, the Delaware Mobile Surf Fishermen (DMSF) generously solidified their support of CMS by approving funding that will guarantee a scholarship as an annual award to a qualified student. "The research that is supported by this award will contribute to the protection and enhancement of the health of the Delaware Bay," says Dr. Ann Hastings, chair of the fishing group's Subcommittee on Scholarships. "Continued research will ensure that the abundance of marine animals and plants will continue to thrive, providing beauty and pleasure for us to enjoy now and in the future."

This year's recipient of the \$1,000 scholarship was Kevin Stierhoff, a master's student in marine biology-biochemistry. Under the guidance of Professor Timothy Targett, Stierhoff is studying the effect of low dissolved oxygen on young summer and winter flounder. Stierhoff is a native of Owings Mills, Maryland.



Bob Bowden

Kevin Stierhoff (center) is congratulated by Greg Spicer (right), president of the DMSF. Professor Timothy Targett is on the left.

In Memoriam

On May 22, CMS lost a great friend when Phillip J. Wingate passed away. He was 87. Dr. Wingate was a founding member of the Marine Associates and was an enthusiastic supporter of its activities, serving as the second chairman in 1980.



P. J. Wingate

Dr. Wingate's love for the marine environment began when he was a young boy exploring the marshes in Dorchester County on the lower Eastern Shore of Maryland. He remained close to his roots throughout his lifetime.

In 1933, Dr. Wingate graduated with a bachelor's degree in mathematics from Washington College, Chestertown, Maryland. He taught for several years in the Maryland school system before earning his master's and Ph.D. in chemistry from the University of Maryland.

Dr. Wingate retired in 1978 from the DuPont Company. He had a long and successful career as a research chemist and served as company vice-president and general manager of the Photo Products Department.

In retirement, he turned his attention to writing — authoring five books including *Bandages of Soft Illusion*, *Before the Bridge*, and *The Colorful DuPont Company*. In addition, his articles have appeared in such diverse publications as the *Washington Post*, *Wall Street Journal*, *Los Angeles Times*, *Baltimore Sun*, and *Wilmington News Journal*.

Dr. Wingate was an active board member of his undergraduate alma mater, Washington College, and Wilmington College. He was a trustee of the University of Delaware Research Foundation from 1979 to 1984 and was also affiliated with Lehigh University and his graduate alma mater, the University of Maryland.

Dr. Wingate's gentle humor and perceptive observations are captured in the story at right about Hugh R. Sharp, Jr., his long-time friend. CMS is honored to have the opportunity to share Dr. Wingate's reminiscences with the readers of *At Sea*.

Oysters, Chickens, Zebra Mussels, El Niño, and the College of Marine Studies

by P. J. Wingate

Editor's Note: Several months before author Phillip J. Wingate passed away, he wrote this article about his great friend, Hugh R. Sharp Jr., after whom the University's Hugh R. Sharp Campus in Lewes is named. Both gentlemen will be long-remembered at CMS for their stalwart support, enthusiasm, and sense of humor.



Hugh R. Sharp, Jr.

The late Hugh Rodney Sharp, Jr., long-time trustee of the University of Delaware, was a very witty and farsighted man.

He showed his sense of humor in many ways, but the name he gave his airplane, which he flew from the oil fields of Alaska to South America and other places in between, was a good example of his wit. He had the name Pandemonium Airlines printed in large letters on this plane, and when a mechanic in St. Louis asked him if pandemonium was in Asia or Africa, he replied: "Neither one. It is wherever I happen to be."

His truly remarkable foresight in environmental matters was displayed about as widely as his airplane, but I remember it most vividly in connection with oysters, chickens, zebra mussels, El Niño, and the Marine Associates of the University of Delaware's College of Marine Studies.

It all began in 1976, when I was eating some oysters on the half-shell at one of the dinners the DuPont Company used to hold in those days. Hugh Sharp, a member of the Board of Directors of DuPont, came up to me and said: "I see you like oysters, but do you know that they may soon be an endangered species? They are already scarce in the Delaware Bay."

I told him I did know that, and also that they were becoming scarce in the Chesapeake Bay, too, but my old friend, Dr. Reginald Van Trump Truitt, said there were thousands of coves and inlets around the world where oysters still flourish, so I was not worried about a supply of oysters on the half-shell. Hugh's eyes lit up when I mentioned Dr. Truitt, and he asked if I knew him personally. I said I did, that he was a long-time friend of my family, and that I admired him for two reasons. First, because he had coached the University of Maryland's lacrosse team to its first undefeated season, and second because he had founded the first marine biology laboratory on the East Coast, at



Solomon's Island in the Chesapeake Bay. Hugh said that he, too, admired Dr. Truitt but had never met him. We talked about oysters a few minutes more, and then he invited me to have lunch with him, the next day, in the Green Room of the Hotel du Pont.

At that lunch, we both had oyster stews, and Hugh said his father told him that when the hotel had its grand opening dinner in 1913, it had served oysters on the half-shell from Maurice River Cove in Delaware Bay and they were delicious. "But," he added, "when the hotel holds its 75th anniversary dinner, they won't have Maurice River oysters because they have all disappeared from the cove even though some still grow in the less salty water of the river itself. That is a shame because these oysters don't taste as good as those from the cove. So the hotel will probably have to import its oysters in 1988."

He went on to say that this was one of many reasons why he had urged the University of Delaware to start a College of Marine Studies and why he had founded the Marine Associates, to encourage and support the new college, which would need a lot of support from the legislature and the general public. He said he hoped that all the other states on the East Coast would follow the examples of Maryland and Delaware and start marine colleges, because the rivers and oceans of the world have been very little studied by scientists, and programs to understand them were going to cost more than Delaware and Maryland can afford. "The public has to be educated first," he said, "to the benefits which can come from marine studies."

"This," he said to me, "is where you come in. We have been trying to educate the public and I would like you to become a member of the Marine Associates. He paused there, and a grin crossed his face before he added, tongue-in-cheek: "We don't work very hard at it, and you strike me as being lazy enough to fit right in with the rest of the Marine Associates."

I told him that his invitation was put in such flattering terms that I couldn't turn it down. So I became a member of the Marine Associates, and have been one ever

since. It has been a pleasant association, so pleasant in fact, that three years later I served a term as chairman of the Marine Associates, after having been nominated in a speech by Hugh Sharp which was as flattering as his original invitation to become a member. He said, "I think we need a change of management, and Wingate probably will do no harm even if he does no good."

During our long association as members of the Marine Associates, I heard Hugh Sharp talk about many things involving the Delaware Bay, its rivers and coves, and the nearby Atlantic Ocean, but the three which I remember best were zebra mussels, chickens, and El Niño. The first two were one-time items, but the last one, El Niño, had many parts.

Hugh told me one day that zebra mussels had been transplanted from Europe into the Great Lakes and were creating real problems. I told him I knew what a zebra was and what a mussel was, but I had never heard of a zebra mussel. He explained that a zebra mussel was like an ordinary mussel, except that it had black and white stripes on its shell. Anyway, he said it had come into the Great Lakes after the St. Lawrence Seaway was opened, thereby permitting ocean-going freighters to come into the lakes, and the mussels had come in attached to the hull of some vessels from Europe, or perhaps in the bilge water or ballast which the ship had discharged. But once there, they had grown like weeds and were plugging up lines to power plants and interfering with other animal life in the lakes. "We have more foreign ships coming into the Delaware Bay," he said, "than ever enter the St. Lawrence and nobody knows what they are bringing to us. I think the University should make a study of this problem before it gets to be as serious as the one with the zebra mussels in the Great Lakes."

Chickens were treated pretty much the same way. One day when Hugh and I were riding in a car going to a Marine Associates' meeting in Lewes, we passed by a large chicken farm and he pointed to a huge pile of chicken manure at one end of the barn: "There is another problem which the University should study before it gets too big to handle. We used to import guano from South America to fertilize our fields but now we grow our own. I guess that is a good thing but it is easy to overdo a good thing, like the guy who drinks a martini for lunch and likes it so much that he drinks four more and runs into a culvert on the way home and kills himself." He dropped the subject there and never brought it up again when I was near.

El Niño was different. He brought it up again and again. El Niño puzzled him, he said, because the news media blamed it for

everything: floods along the Mississippi and droughts in Arizona, blizzards in Georgia and heat waves in Alaska, hurricanes in Florida and tornadoes in Texas. "You name it," he said, "and El Niño gets the blame for it. Not only that, but it is all due to global warming caused by increased carbon dioxide in the air."

He said he could understand that carbon dioxide is what is called a greenhouse gas, so more carbon dioxide in the air would tend to keep the Earth a little warmer, but he was by no means sure that the Earth was really warming up. "I remember," he said, "that a few years ago, the newspapers and TV were saying the Earth had cooled down half a degree during the past 10 years, and we should all prepare for a new ice age. Now they say it has warmed up a degree due to more carbon dioxide in the air, which will make El Niño worse and create all sorts of disasters."

He went on to say that the Spanish in California had given El Niño its name 300 or so years ago, long before we began to burn fuel oil and gasoline, and that it had varied from year to year even then so he didn't see how it makes sense to blame everything on a small increase in carbon dioxide from about .035% to .055%.

"It all seems to start in the Pacific Ocean," he said, "and one year it is bad and the next year it is terrible. But the third year, El Niño barely shows up at all while the carbon dioxide hasn't changed enough to detect any appreciable change. I think that something goes on deep in the Pacific, which we don't understand and that causes El Niño to vary so much. There may be a lot of volcanoes hidden in the Pacific, as well as on the rim of it, and these volcanoes erupt from time to time, on a schedule of their own, to warm up the water."

Then he added something which has remained stuck in my memory ever since. "We need to explore the oceans far more than we have so far because to blame variations in El Niño on tiny changes in the carbon dioxide in the air while ignoring all the other things such as underwater volcanoes is silly. It is like trying to explain why water in the Mississippi River at New Orleans on March 1 is colder one year than another by counting the snowballs thrown in the Mississippi at St. Paul, Minnesota, by school boys during February, while ignoring both the amount and temperature of the rain falling in February in the Mississippi River itself as well as its tributaries such as the Missouri and Ohio rivers."

On another occasion he told me that the geology of the oceans needed to be studied as much as their chemistry and biology because there probably were changes going on there, such as the formation of

new mountains like the ones which produced Hawaii and the other islands near it, which would surely affect both the weather around the world and life on land and sea.

Hugh Sharp died in 1990 before all of the things he had talked about came true but not before some of them did.

When the Hotel du Pont celebrated its 75th anniversary in 1988, it did serve oysters on the half-shell but they did not come from the Maurice River Cove. Instead, they were imported from France and its Belon River Cove, which is as open to the Atlantic Ocean as the Maurice River Cove and so the Belon oysters had that same salty taste.

He did miss reading in the April 1995 issue of *Smithsonian* magazine that "just two years ago, for example, scientists discovered in the mid-Eastern Pacific, the world's densest concentration of active volcanoes, more than 1,100 sprawled across an area the size of New York State." All believers that only carbon dioxide affects El Niño should take note.

All this would have pleased Hugh, I believe, but he would have been even more pleased, I suspect, by some other developments.

One of his sons, William M. W. ("Bill") Sharp, is now chairman of the Marine Associates, and he and Dr. Carolyn Thoroughgood, Dean of the College of Marine Studies, arranged the most exciting public presentation in the history of the Marine Associates. This occurred on October 14, 1998, when they brought Dr. Robert Ballard, the famous marine explorer who found the long-lost sunken *Titanic* to the Bob Carpenter Center for a lecture and exhibit. It drew an enthusiastic crowd of about 3,000 people, many of them students who swamped Dr. Ballard with requests for his autograph.

Finally, at a recent meeting of the executive committee of the Marine Associates, Dean Thoroughgood announced she has requested that the University of Delaware add geology to the list of sciences included in the College of Marine Studies. And if the Dean succeeds in making her request a reality, the new geology students may be as excited as I believe Hugh Sharp would be about another statement in the *Smithsonian* magazine which said, "Hidden beneath the waves are mountain ranges soaring higher than the Himalayas, chasms plunging deeper than the Grand Canyon, and plains spreading out larger and wider than the Serengeti."

If they explore the Pacific thoroughly, they may find that Chile has even more coves suitable for growing oysters than ones now exporting them to New York City grow.

Interns Gain Hands-On Experience

Twelve students from universities around the nation recently participated in the Research Experiences for Undergraduates at the Hugh R. Sharp Campus in Lewes. The summer internship program is in its 14th year and is supported by the National Science Foundation and coordinated by CMS professor Jonathan Sharp.

During the 10-week program, each student worked on an independent research projects with advice from a CMS faculty mentor. At the conclusion of the program, they presented their results in written and oral form. In addition, the interns attended weekly seminars and participated in a research and training cruise aboard the research vessel *Cape Henlopen*.

Garrett Hageman worked with adviser Jon Sharp to study the relative carbon and nitrogen nutrition of phytoplankton using different nitrogen sources. Under the guidance of chemist George Luther, Laura Hohmann conducted a voltametric analysis of microbial mats in the salt marsh to determine what inorganic sulfur compounds form when hydrogen sulfide is oxidized.

Bonnie Chang, with adviser William Ullman, analyzed the chemical changes that occur as groundwater and surface estuarine water mix and react with aquifer material in the lower Delaware Bay. Working with Chris Sommerfield, Ashley King studied the physical processes that influence the distribution of benthic invertebrates in sediments of the upper Delaware Bay and determined if the distributions varied over time.

The Japanese shore crab was the focus of two projects. Sahrye Cohen worked

with scientist Adam Marsh to examine the differences in metabolism between different larval stages to help explain their survival in estuaries where the temperature and salinity constantly changes. Marissa Stratton and Lizzie Nelson worked under Charles Epifanio and Ana Dittel to see if chemical cues can predict settlement and metamorphosis of the crab. This work will help determine whether this non-native species will invade marshy areas.

Rachel Forbes worked with adviser Craig Cary to develop a method to measure low levels of brown tide in estuaries. When this non-toxic organism blooms, it can block sunlight from reaching grass beds that many fish species use as nurseries. Under the guidance of Timothy Targett, Alex Nord studied the effects of temperature, salinity, and dissolved oxygen on juvenile fish development.

Jesse Smith, Jr., worked with adviser John Boyer to see how marine plants become larger. He used a brackish-water alga with large cells and designed a microscopic method to watch how macromolecules enter the cell walls.

Tarron Herring and Yusuf Al-Rahman also participated in the summer program under the sponsorship of the Department of Energy. Working with marine biologist David Kirchman, Herring isolated a bacterium that produced a red pigment and explored whether it protects the bacterium from the sun or if it binds toxic and essential trace metals. Al-Rahman used a DNA probe to identify the different bacteria in marsh waters without culturing them.

Mangone Lecture Focuses on River Commerce

The second annual Gerard J. Mangone Distinguished Lecture was held May 4th at the Christiana Hilton in Newark, Delaware. This year's lecture focused on the importance of Delaware River commerce to both the state and region. Dennis Rochford, president of the Maritime Exchange for the Delaware River and Bay and the National Association of Maritime Organizations, was the guest speaker.



Professor Gerard J. Mangone (left), Dean Carolyn Thoroughgood, and Dennis Rochford at the second annual Gerard J. Mangone Lecture.

Mangone, University Research Professor of International and Maritime Law, has been involved with the Port of Wilmington for many years. He worked with the port to establish an intern program that gave CMS students hands-on experience in shipping and management. In addition, Mangone has supervised studies of the port's history, its economic value to the community, and its future trade patterns helping to guide the Port of Wilmington into the 21st century.

The Port of Wilmington is a member of the Maritime Exchange, a non-profit trade association that is the premier advocate for the businesses and ports of the Delaware River and Bay. Rochford has been instrumental in promoting the Delaware River and Bay as a leader in the commercial maritime industry. Under his guidance, the Exchange has developed a comprehensive computerized system that tracks ships as they navigate through the port. This system has led to substantial cost-savings, increasing the port's competitiveness.

Rochford praised Mangone's role in helping to recommend the transfer of the Port of Wilmington from the city to the state as he highlighted the port's economic impact to Delaware. "Last year, 300-400 ships arrived in the port, generating \$11 million in state and local taxes alone," reported Rochford.

Dean Carolyn Thoroughgood established the annual lecture series last year to recognize the stellar contributions that Mangone has made in the field of marine policy and which he continues to make to CMS.



Meet CMS's summer 2000 interns: (front row, from left) Garrett Hageman (University of Washington), Bonnie Chang (University of Virginia), Lizzie Nelson (Missouri Western State College), Marissa Stratton (Washington State University), Sahrye Cohen (Tufts University); (second row, from left) Tarron Herring (Lincoln University), Rachel Forbes (Vanderbilt University), Ashley King (Johns Hopkins University), Jesse Smith, Jr. (University of Delaware), Yusuf Al-Rahman (Lincoln University), Alex Nord (Carleton College), and Laura Hohmann (University of California).

Garvine Honored at Reception

On January 24, CMS recognized Richard Garvine, professor of physical ocean science and engineering, for his many accomplishments as a teacher and scholar. Friends, colleagues, and former students gathered at a reception and dinner held in honor of his 60th birthday at the Annual Ocean Sciences Meeting. Garvine was presented with a gift certificate for \$1,000 in enhancement funds by Dean Carolyn Thoroughgood.



Jack Buxbaum

Richard Garvine



Garvine received his bachelor's degree in aerospace engineering from the Massachusetts Institute of Technology in 1961 and his doctorate in mechanical and aerospace science from Princeton University in 1965. After four years working in industry as a theoretical aerodynamicist, he began his academic career as an assistant professor at the University of Connecticut in 1969.

In 1977, Garvine joined CMS and firmly established his reputation as a teacher the following year by receiving an Excellence in Teaching Award from the college. This award was followed by the coveted University Excellence in Teaching Award in 1985. In 1991, he was named the Maxwell P. and Mildred H. Harrington Professor of Marine Studies in recognition of his distinguished service as a teacher and a scholar.

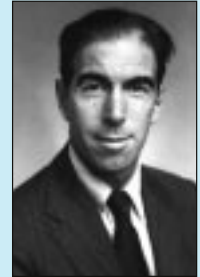
Garvine's research focuses on the coastal ocean and estuaries, in particular, the physics of their circulation. His current projects include a study on the effects of wind, freshwater discharge from estuaries, and tidal forces on the circulation of water on the continental shelf; the upwelling of cold, deep water onto the shore as the summertime winds drive the warmer waters offshore; and the role of coastal circulation in the dispersal and recruitment of blue crab larvae.

Marine Associates' Corner



From the Chairman

Being a Marine Associate is one of the most pleasant, educational, and rewarding experiences a person may have. Through the years, I've made many wonderful friends as a result of my membership. The common bond we share is an interest in the ocean and in helping the University of Delaware College of Marine Studies develop one of the leading marine programs in the nation.



Robert Cohen

I'm fortunate to have grown up in a family that always had a curiosity about and love for the ocean. In fact, it was this fascination with the sea and an appreciation of the benefits of marine research that spurred my father to help found the Marine Associates years ago.

On the afternoon of January 14, 1979, a group of 34 staunch supporters and friends of the college met in the ballroom of the University's Goodstay Center in Wilmington to form the Marine Associates. My father, Hugh R. Sharp, Jr., was elected the organization's first chairman and took on the task with enthusiasm.

I read with great fondness the reminiscences that P. J. Wingate shared about my late father in the article on pages 6 and 7 of this issue. Pop would be pleased to know that his family and friends have learned a lot about El Niño and many other phenomena from the lectures we've heard at the college, from the scientists and students we've met, and from the hands-on activities offered at Coast Day and other events. And we've been proud to contribute financially to the college as it continues to help the next generation of marine scientists achieve a superlative education.

If you think you might like to join the Marine Associates, it would be my great pleasure to welcome you aboard. Why not reserve your seat for our next meeting, or come to the next lunchtime lecture at the Hotel du Pont in Wilmington and enjoy the great food and the food for thought?

Also, don't miss the college's 24th annual Coast Day festival, set for Sunday, October 1, from 11 a.m. to 5 p.m., at the Lewes campus. You can take part in dozens of activities, from learning about the latest marine research to eating fresh-cooked crab cakes and other seafood.

Call the college at (302) 831-2841 for more information about any of these events. I look forward to seeing you soon!

William M. W. Sharp

William M. W. Sharp

Students Host Symposium

The first CMS Graduate Student Symposium for Marine Policy and Science was held last October at the Lewes campus. Fifty-five CMS students gathered to discuss their work through oral and poster presentations. The symposium created a lively forum where students shared their research and received valuable feedback from fellow students.



Bob Bowden

In addition to the presentations, the symposium included guided field trips to the Great Marsh (see photo) and the sand flats of Cape Henlopen State Park, as well as dinner at the Dogfish Head in Rehoboth Beach and a barbecue.

Carole A. Di Meo and **Nicole B. Lopanik**, doctoral students in marine biology-biochemistry, were instrumental in organizing the symposium. The overwhelming student enthusiasm for the symposium made this first venture a tremendous success, and plans are under way to make the event an annual tradition. For more information, visit the symposium Web site at www.ocean.udel.edu/courses/symposium/index.html.

Adam Marsh Joins Faculty

CMS recently welcomed Adam Marsh to the faculty. As an assistant professor in the Marine Biology-Biochemistry Program, he will teach graduate courses in marine biochemistry with special emphasis on the structure and function of proteins essential to marine life.



These Antarctic urchins are holding pieces of a red algae on top of their bodies, a common but unexplained behavior in sea urchins.

Marsh earned his Ph.D. in marine science from the University of Maryland. He also has a master's degree in invertebrate zoology and bachelor's degrees in zoology and English literature from the University of South Florida.

His honors include the Lerner-Gray Marine Science Award for Molecular Ecology and a Postdoctoral Fellowship in Biotechnology from the National Science Foundation (NSF). Additionally, he is associate director for the NSF course "Biological Adaptations of Antarctic Marine Organisms" at McMurdo Station, Antarctica, and has served as one of its instructors for the past seven years.

"My research has focused on understanding how the embryos of marine invertebrates develop under harsh environmental conditions. This has taken me to the polar seas of the Antarctic and the deep-sea basins at the bottom of the ocean," Marsh says. "Temperature is an important environmental constraint impacting development in these extreme habitats," he notes. "I see many possibilities for future comparative work in the Delaware Bay estuary, which can experience large changes in seasonal water temperatures."

A second area of Marsh's research will focus on the ability of early life stages of marine invertebrates to recognize pathogens in the environment and initiate an appropriate cellular response to prevent infections. This work will be focused on the interaction between oyster larvae and a protozoan parasite that causes a severe disease in adult oysters called Dermo. Understanding how oyster larvae respond to a Dermo attack could help lead to the future development of disease-resistant oysters.

Marsh's office is in Smith Laboratory at the Hugh R. Sharp Campus in Lewes. His phone number is (302) 645-4367, and his e-mail address is amarsh@udel.edu. To learn more about his research, visit his Web site at www.ocean.udel.edu/faculty/amarsh/marsh.htm.



Adam Marsh

Bob Bowden

CMS Tours Are Tops

For the past nine years, the CMS docents have been donating their time, giving public tours of the college's research facilities at the Hugh R. Sharp Campus in Lewes. Over the years, the tours have introduced more than 10,000 visitors to the college and its activities.

The following docents were recognized at CMS's Honors Day ceremony in May: Bob Carnahan, nine years; Jean Boyer, one year; Dorothy Danegger, two years; Charles N. Freed, two years; James H. Gillard, nine years; Kay Hackett, five years; and Russell Payne, five years. Each docent was presented with a jacket that featured a "seafood salad"—consisting of one marine animal for each year of service—embroidered near the chest pocket.



Bob Bowden

CMS docent Jim Gillard leads a tour of the Hugh R. Sharp Campus in Lewes.

Each tour typically begins with a 15-minute introductory video presentation, followed by a one-hour walking tour of Cannon and Smith Laboratory buildings. In these labs, faculty and graduate students are working on projects with both local and global significance. For example, one group of researchers is working to reveal the conditions that make some Mid-Atlantic estuaries vulnerable to *Pfiesteria* and other harmful algae. Others have discovered that the deep-sea Pompeii worm can withstand temperatures of 176°F near hydrothermal vents over a mile deep on the ocean floor.

This year, the overwhelming popularity of the tours has prompted the Delaware River and Bay Authority to provide a shuttle for interested passengers on the Cape May-Lewes Ferry.

The enthusiasm of the docents has contributed significantly to the tour's appeal to ocean lovers of all ages. "The docents are all local residents who enjoy talking and meeting with people who share the same interests," says Bob Carnahan, who began the program. Carnahan is a retired administrator from the National Oceanic and Atmospheric Administration.

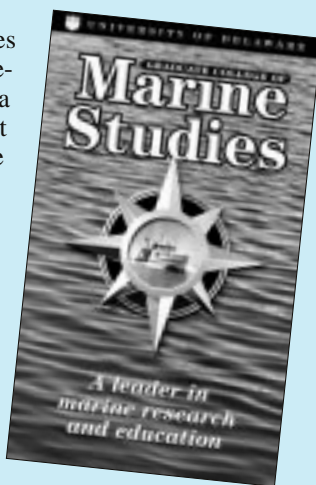
Introducing the CMS Video

"What we know is a drop. What we don't know is an ocean."

This famous quote by Sir Isaac Newton introduces the new CMS video. The exciting 15-minute presentation, which was produced by University Media Services, will be used to showcase the ingredients that make CMS a globally recognized leader in marine research and education.

Viewers are whisked from the beaches of Delaware to research labs as they are introduced to the scientific projects being conducted by CMS faculty and graduate students. The projects encompass a vast arena of research in the marine sciences—from the decline of the horseshoe crab population in Delaware Bay to El Niño and global warming.

For more information, please contact the UD Marine Communications office at (302) 831-8083.



DIVE IN
EXTREME 2000
Voyage to the Deep



Many people are familiar with the classic television show “Voyage to the Bottom of the Sea” where audiences were introduced to the magic of the undersea world through the explorations of the atomic submarine *Seaview*. In January, the public was able to get a taste of a real undersea adventure when they were able to travel along, via the Internet, with the scientists aboard the Extreme 2000 research expedition — the first deep-sea expedition of the millennium.

Extreme 2000 traveled to hydrothermal vent sites on the floor of the Sea of Cortés off the west coast of Mexico. The expedition was part of a program initiated by the National Science Foundation (NSF) called Life in the Extreme Environment. Although the primary research goal was to investigate hydrothermal vent sites and their bizarre community of organisms, chief scientist Craig Cary worked closely with Tracey Bryant, marine outreach coordinator in the Marine Communications Office, to increase public awareness of the project.

The resulting multimedia project — “Extreme 2000: Voyage to the Deep” — received international attention for its content and design. The project included a full-color resource guide, a half-hour classroom video, and an interactive Web site (www.ocean.udel.edu/deepsea). The educational project was a partnership between NSF, the University of Delaware Sea Grant College Program and the Graduate College of Marine Studies, and WHY-TV (PBS/Wilmington and Philadelphia).

The Web site, which was designed by CMS art director David Barczak, featured text, graphics, and video clips under the headings “Mission and Crew,” “Seafloor Geology,” “Creature Features,” “Toxic Chemistry,” and “High-Tech Tools.” The site also included a resource center and a special section entitled “News from the Deep,” where video clips, photos, dive logs, interviews with the scientists, and daily journals were uploaded daily during the expedition. This information was transmitted from ship to shore with the assistance of researchers from the Woods Hole Oceanographic Institution.

A highlight of the project was a conference call between Dr. Cary in the submarine *Alvin* and students in 11 classrooms in Delaware, New Jersey, and California. A spokesperson for each class asked CMS graduate student Alison Sipe about life onboard the research ship *Atlantis* in the Sea of Cortés. The call was then patched through to *Alvin* on the seafloor, and each class had an opportunity to ask Dr. Cary a question. The excitement of the students is obvious in the audio file of the call, which is available at the Web site under “News from the Deep.”

Dive in to www.ocean.udel.edu/deepsea

Alumni Update

Editor’s Note: Alumni Update, a periodic feature of *At Sea*, helps our graduates stay in touch and illustrates the exciting careers built on a CMS education.

Douglas Hicks

M.S., Applied Ocean Science/Ocean Engineering, 1980

Ph.D., Applied Ocean Science/Ocean Engineering, 1985

Since graduating from CMS in 1985, Doug Hicks has been developing instruments and equipment for a wide variety of scientific applications.



Robert Cohen

Douglas C. Hicks

His clients have included both researchers at universities and labs and private businesses. Hicks credits CMS for giving him the breadth of knowledge that is required to understand the needs of all his clients. His graduate work in ocean engineering, under the guidance of his adviser, Charles “Mic” Pleass, resulted in five patents which are held jointly with the University.

For the past two years, Hicks and John Protack, his partner at CHPT (Composite High Pressure Technologies Manufacturing, Inc.), have worked closely with CMS scientists to design the specialized equipment needed for collecting deep-sea specimens and data.

“Dive time is very expensive,” reports Hicks. “It’s crucial that the equipment not malfunction in the extreme temperatures and pressures that are encountered at the vent sites.” For the Extreme 2000 expedition (see article left), Hicks’s company was instrumental in designing and building both the aquaria that held the deep-sea animals and the sample chamber that transported the critters back to the surface. They also provided engineering and fabrication support for the ‘Sipper’ that was used to collect water samples, the electrochemical analyzer used to identify the chemicals at the vent sites, and the core squeezers used to collect sediment samples.

When Hicks isn’t busy designing new equipment, he wears the hat of professor and department chair for engineering technologies at the Owens Campus of Delaware Technical and Community College in Georgetown.

“I really enjoy educating engineering technology students to help prepare them for productive careers in industry,” he says. “I hope to share some of the lessons I’ve learned from starting and running my own business to supplement the science and engineering my students learn while in school.”

Doug Hicks, President
CHPT Manufacturing, Inc.

100 Dock Road
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(302) 645-4314 ♦ dhicks@outland.dtcc.edu

Faculty Tidings

Charles Epifanio, professor of marine biology-biochemistry, received a special honor at the bi-annual meeting of the Estuarine Research Federation in September 1999. The Estuarine Research Federation is an international group of approximately 1,000 individuals from different disciplines who study and manage the structure and functions of estuaries and the effects of human activities on these fragile environments. Student participants nominated Epifanio as one of the scientists they would most like to meet and interact with during the conference. Students were interested in Epifanio's research on the role that natural forces play in controlling the population of the blue crab fishery in the Delaware Bay as well as his studies on deep-sea vent crabs. Epifanio's vent crab research was also highlighted in a recent edition of the *New Scientist*, an international science and technology news weekly.



Charles Epifanio

Robert Cohen

Lee G. Anderson, director and professor of marine policy was invited to be a keynote speaker at the FishRights99 conference "Use of Property Rights in Fisheries Management" held in Fremantle, Australia, in November. The conference, sponsored by Fisheries Western Australia in cooperation with the Food and Agriculture Organization of the United Nations, attracted over 300 participants from 50 countries. Anderson's talk focused on the selection of a property rights fishery management system. The control of property rights in fisheries is a controversial topic, but is important in maintaining fisheries at a sustainable level.



Lee G. Anderson

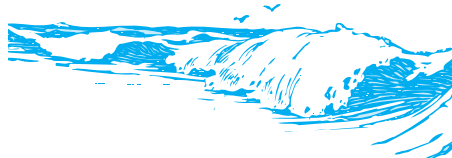
Robert Cohen

Mohsen Badiey, associate professor of physical ocean science and engineering, has been elected a fellow of the Acoustical Society of America. He received the honor for his "contributions to the understanding of the effect of sediment properties on shallow-water sound propagation." Badiey also holds a joint appointment in the College of Civil and Environmental Engineering. Founded in 1929, the Acoustical Society of America is regarded as the premier international scientific society in acoustics, dedicated to increasing the knowledge of the science of sound and its applications. There are over 7,000 members in this society in fields ranging from oceanography and physics, to speech and hearing. There are 800 fellows in the society. Badiey is one of 30 scientists who were awarded the honor during the past year.

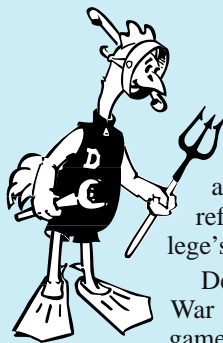


Mohsen Badiey

Robert Cohen



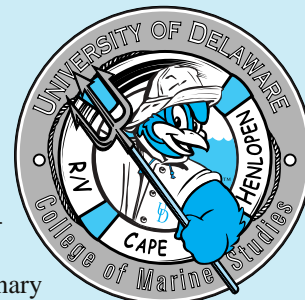
"YoUDEe Sets Sail for Marine Research"



Many people are familiar with the comical illustration of the University of Delaware's "Fightin' Blue Hen" equipped for work at the College of Marine Studies. The drawing (left) was made in 1972 by Dr. Paul Catts, a professor of entomology at the University. The illustration, affectionately referred to as "the Chicken of the Sea," has appeared for many years on the college's 120-foot research vessel, the *Cape Henlopen*.

Delawareans have been known as the "Fightin' Blue Hens" since the Revolutionary War when the first Delaware regiment carried Kent County Blue Hen gamecocks. The gamecocks were prized for their fighting ability. The regiment earned a similar reputation for valor.

This year, the faithful fowl will be retired from service and replaced with the University's official mascot, "YoUDEe." The illustration (right), of YoUDEe at sea, was drawn by Keith Heckert, an artist at University Media Services.



AT SEA
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