VIMS Dedications Kauffman Aquaculture Center

VIMS dedicated its new Kauffman Aquaculture Center in a ceremony at the Topping, Virginia facility in April. Guests of honor included NOAA Chief Administrator Conrad Lautenbacher, Virginia Secretary of Natural Resources W. Tayloe Murphy, Jr., and Susan Magill, Rector of William and Mary.

The Kauffman Aquaculture Center (KAC) was specifically designed to enhance and extend the work and facilities of VIMS Aquaculture Genetics and Breeding Technology Center (ABC). The General Assembly established ABC in 1995 to explore and promote the development of aquaculture in the Commonwealth. The Kauffman Center lies 30 miles north of Gloucester Point on a tributary of the Rappahannock River known as Locklies Creek. Construction of the $1.4 million Center was funded through a challenge grant by Boots and Jack Kauffman, with matching grants provided by Mr. Matthew T. Blackwood; the D. Keith Campbell Foundation for the Environment, Inc.; Mr. and Mrs. Weston F. Conley, Jr. and Family; Dominion; the Elis Olsson Memorial Foundation; Mr. and Mrs. E. Claiborne Robins, Jr.; Mr. and Mrs. James E. Rogers; and the Smurfit-Stone Container Corporation. ABC Director Dr. Stan Allen notes that “the Kauffman Center significantly expands the scope of aquaculture research at VIMS by providing a facility that was specifically designed to hold both native and non-native species in quarantine.” Initial use of the facility will focus on studies of the native oyster Crassostrea virginica and the non-native oyster Crassostrea ariakensis.

The facility features four separate laboratories that were each purpose-built to protect Chesapeake Bay and its living resources from disease, parasites, and the unintentional introduction of non-natives:

- Oyster Isolation Laboratory – This room is designed to hold recently shipped oysters.
- Construction of the $1.4 million Center was funded through a challenge grant by Boots and Jack Kauffman, with matching grants provided by Mr. Matthew T. Blackwood; the D. Keith Campbell Foundation for the Environment, Inc.; Mr. and Mrs. Weston F. Conley, Jr. and Family; Dominion; the Elis Olsson Memorial Foundation; Mr. and Mrs. E. Claiborne Robins, Jr.; Mr. and Mrs. James E. Rogers; and the Smurfit-Stone Container Corporation. ABC Director Dr. Stan Allen notes that “the Kauffman Center significantly expands the scope of aquaculture research at VIMS by providing a facility that was specifically designed to hold both native and non-native species in quarantine.” Initial use of the facility will focus on studies of the native oyster Crassostrea virginica and the non-native oyster Crassostrea ariakensis.

The report notes that coastal watershed counties generate five trillion dollars in economic activity each year, one half the U.S. gross domestic product. It estimates that an annual investment of $3.2 billion is needed to help stave off the threats posed by continued degradation of ocean and coastal environments, and recommends payment through a trust fund composed of federal revenues from oil and gas development. Federal oil and gas revenues total approximately $5 billion annually.

Continued on page 8

Report Bolsters VIMS Agenda

Close parallels between VIMS programs and recommendations in the recent U.S. Ocean Commission report confirm the Institute’s bearings help stave off the threats posed by continued degradation of ocean and coastal environments, and recommends payment through a trust fund composed of federal revenues from oil and gas development. Federal oil and gas revenues total approximately $5 billion annually.

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Isabel Recovery in Full Swing

Like many of its neighbors, VIMS is still working to restore, replace, and rebuild areas hit by Hurricane Isabel in September. The storm destroyed all three of VIMS' research piers, claimed 18,000 sq ft of workspace, and displaced 34 scientific and support personnel.

“We’ve made a great deal of progress this spring,” says VIMS Director of Facilities Management Joe Martinez. “The finfish aquaculture building, submerged aquatic vegetation greenhouse, and sea turtle greenhouse are all operational. The seawater distribution system, required for research support, is back up and running as well.”

“The Teaching Marsh and Maritime Forest were open again for the public in May, just in time for Marine Science Day and public tours,” adds Public Relations Coordinator Susan Maples. “We owe great thanks to CCRM [Center for Coastal Research and Management] staff for their efforts to re-plant the vegetation that was lost to the storm and to re-landscape the area.”

Reconstruction of VIMS’ new piers will be completed by the end of June. Replacement windows for Chesapeake Bay Hall are scheduled to be installed by mid-July.

“While some buildings are still waiting to be repaired, most of the reconstruction needed for continued research has been completed,” says Martinez.
Mann Urges Congress to Enact Ballast Water Standard

Dr. Roger Mann, Acting Director for Research and Advisory Services at VIMS, testified before the U.S. House of Representatives in March concerning newly proposed international standards for managing invasive species in the ballast water of seagoing vessels.

Mann contended in testimony before the subcommittees on Coast Guard and Maritime Transport and Water Resources and Environment that the proposed International Maritime Organization (IMO) standards don’t go far enough toward keeping non-native marine species out of Chesapeake Bay and other U.S. waters.

Mann argues for a standard that would require incoming ships to kill 100% of ballast-water organisms larger than 50 microns. A micron is one millionth of a meter. A typical human hair is about 100 microns across.

“A 50-micron standard is sufficiently small to control all the life stages of most marine macro-organisms, including eggs and larvae,” says Mann. He contends that this standard could be met through existing technologies.

Most importantly, says Mann, quick adoption of a clear and quantifiable standard would jump start efforts to refine and develop technologies for improving ballast-water treatment.

Mann says that existing technologies could readily provide treatment that is more effective than traditional practices such as mid-ocean exchange, but that they are being kept from the marketplace by the lack of a consistent standard. Potential treatments include deoxygenation, filtration, heating, and dosing with ultraviolet light.

“We need to establish a clear standard so that entrepreneurs can move forward with research and development of methods to treat ballast water,” says Mann. “The lack of a consistent, quantifiable standard keeps shipping interests and venture capitalists from investing in existing or new equipment due to concerns that a future standard may render it obsolete.”

The proposed IMO standards would limit the population of organisms larger than 50 microns to about 10 organisms per cubic meter of water. Populations of organisms between 10 and 50 microns would be reduced to 10 per milliliter.

The IMO regulations, which would not take full effect until 2016, would allow vessels to meet these standards by exchanging their ballast tanks in mid-ocean. Current IMO guidelines encourage this practice but have no provisions for enforcement.

Mid-ocean exchange of ballast water is the traditional method used to help keep aquatic stowaways from invading foreign ports, but recent studies question its effectiveness.

“Chesapeake Bay is the largest single recipient of ballast water on the East Coast. Norfolk alone receives more than 9,000,000 metric tons of ballast water per year, from 48 foreign ports. Release of ballast water and other human activities have introduced more than 160 non-native organisms to the Bay, including the Rapa whelk, the zebra mussel, and the Japanese shore crab.” Mann.

Mann is an internationally recognized expert on non-native aquatic species and has provided advice on invasive-species issues at all levels of government. He has been studying the Rapa whelk since it first appeared in Chesapeake Bay in 1998.

The House requested Mann’s testimony in light of its re-authorization of the 1996 National Invasive Species Act (NISA), which like the current IMO guidelines encourages mid-ocean exchange or equivalent measures on a voluntary basis. The Coast Guard, which is charged with monitoring the voluntary program, recently conducted a survey that showed the voluntary program is not achieving the objectives of NISA and should be made mandatory.

Mann admits that current technologies do not guarantee the exclusion of smaller phytoplankton and toxic dinoflagellates that cause red tides. But, he says, “We shouldn’t be handcuffed by the search for ultimate control tools while good, although perhaps not perfect, technology is within grasp to address the ecological problem at hand.”


–by Cory Staryk and David Malmquist

Graves Receives Faculty Award

VIMS Professor Dr. John Graves has received the state’s highest honor for professors. Graves was one of 11 statewide recipients of the 2004 TIAA-CREF Outstanding Faculty Award presented by the Commonwealth of Virginia.

Also receiving the honor was Professor Chi-Kwong Li of William and Mary’s mathematics department. William and Mary is the only college or university in the state to have two faculty members recognized.

The General Assembly and governor created the award in 1986. Winners must demonstrate a record of “superior accomplishments in teaching, research, and public service.”

Graves and Li were honored January 21 during a ceremony in Richmond and a luncheon at Gov. Mark Warner’s Executive Mansion. The recipients receive a specially designed plaque and a $4,000 award.

“Our faculty members are truly the heart and soul of the College and their commitment to academic excellence is what makes William and Mary a unique educational experience for all our students,” said William and Mary Provost P. Geoffrey Feiss. “Through their tireless efforts in all aspects of higher education, John Graves and Chi-Kwong Li have both gained the ultimate respect from their colleagues and students. William and Mary is extremely proud to have them represent the College in such a prestigious honor.”

Graves came to VIMS in 1990. He serves as both a professor of marine science and chair of VIMS’ Department of Fisheries Science.

An internationally recognized leader and scholar in the field of fisheries genetics and marine science, Graves has received more than $3 million in research grants or contracts, published research findings in major scientific journals, and made presentations on his research around the world.

Since 1995, Graves has also served as chair of the U.S. Advisory Committee to the International Commission for the Conservation of Atlantic Tunas. Over the past eight years, Graves has helped the commission establish historic rebuilding plans for stocks of western Atlantic bluefin tuna, North Atlantic swordfish, and blue and white marlin.

Graves’ students compliment him for his challenging courses and dedication to their own professional development. In addition to his work at VIMS, Graves has developed a series of courses in marine science for high school teachers and has also volunteered several times to teach an introductory biology course, “Principles of Biology: Organisms, Ecology & Evolution,” to undergraduates at the College’s main campus.

“My courses are rigorous, but I try to make them fun,” Graves said. “I put a great deal of effort into teaching, and I expect as much back from my students. I believe that learning is a very personal process and that the role of an instructor is to inspire students to learn.”

Graves earned his bachelor’s degree in biology from Revelle College at the University of California, San Diego in 1975. He earned his Ph.D. in marine biology from Scripps Institution of Oceanography at the University of California, San Diego in 1981.
VIMS Study Provides Foundation for UN Report

A study by VIMS Professor Dr. Robert Diaz on the causes and consequences of marine “dead zones” forms the basis for a key chapter in the 2003 Global Environment Outlook (GEO) Year Book. The Year Book is an annual review of environmental milestones by the United Nations Environment Programme (UNEP).

The 2003 GEO Year Book identifies the continued ‘fertilization’ of the ocean and consequent growth of oxygen-starved “dead zones” as a key emerging issue that governments must urgently address.

UNEP issued the 2003 edition of the Year Book during the 8th Special Session of the Governing Council and Global Ministerial Environment Forum, which met in Jeju, Korea in March.

Diaz is a world-renowned expert on nutrient pollution and the effects of low oxygen levels on bottom-dwelling organisms. In 1995, he wrote a seminal article on the topic in Oceanography & Marine Biology Annual Review. The chapter in the 2003 GEO Year Book draws heavily on the findings of a more recent Diaz paper on dead zones, which will be published later this year in an Environmental Protection Agency report. VIMS graduate student Janet Nestlerode also contributed to the EPA report.

Dead zones occur when and where pollution by excess nutrients triggers low oxygen levels, making it difficult or impossible for fish, marine mammals, oysters, and other marine creatures to survive. The economic costs associated with dead zones are unknown, but predicted to be significant on a global scale.

Diaz notes that the number and size of dead zones has doubled every decade since the 1970s, and that about 150 such zones now exist in the world’s oceans and seas. They range in size from a few hundred acres to more than 25,000 square miles, about the size of West Virginia. A dead zone that developed in the Chesapeake Bay during July 2003 covered about 250 square miles. Some of the earliest recorded dead zones were in Chesapeake Bay. The most well known dead zone is in the Gulf of Mexico. Its occurrence is linked to nitrogen fertilizers brought to the Gulf by the Mississippi River.

Diaz argues that dead zones are fast becoming a bigger threat to fish stocks than over-fishing, a conclusion that the GEO report echoes. He and other experts also warn that global warming, with its likely increase in rainfall, may aggravate the problem. Diaz cites a modeling study showing that a doubling of carbon dioxide would double rainfall across the central US, increasing discharge from the Mississippi River by 20%. The model predicts that increased nutrient inputs from a stronger Mississippi would decrease dissolved oxygen levels in the northern Gulf of Mexico by 30-60%.

The GEO Year Book project was initiated in response to the requirements of the UN’s Agenda 21 on sustainable development and to a 1995 UNEP Governing Council decision.

Assembly Names Library for Hargis

Virginia Governor Mark Warner signed a bill designating the VIMS library the William Jennings Hargis, Jr. Library in an April ceremony at the Capitol. The bill was introduced by Delegate Harvey B. Morgan (R-98th District).

Dr. Hargis led VIMS for 22 years, a period longer than any other director, and one marked by the greatest growth in staff, budget, and facilities. Hargis received the Virginia Life Achievement in Science award in 2003, and VIMS’ Lifetime Achievement award this year.

Businesses in Marine Trades Willing to Pay for Training

A recent VIMS survey shows that marine businesses in the Mid-Atlantic states are ready to support a regional training and certification program for their employees.

Seventy-three percent of marine businesses in the region believe industry certification of workers is necessary, and 51% say the need for basic vocational training is just as important, according to the survey of 300 marine firms from North Carolina to New Jersey.

The certification training most in demand is for outboard and diesel mechanics, followed by fiberglass and electrical technicians, according to Thomas J. Murray, marine business specialist at VIMS.

“Just about everybody seems to agree there is a need for certification for existing employees,” Murray says. “It standardizes what the consumers get.” The survey results also show broad interest in ongoing vocational training, though consensus here is weaker, he says.

Some 320 marine businesses in the Chesapeake Bay region of Virginia, North Carolina, Maryland, and Virginia responded to the survey. Those businesses included 211 boatyards and marinas, 131 marine service and support companies, 102 boat and motor dealerships, 70 boat brokerages, and 27 boat and equipment manufacturers.

Altogether, the companies employ 5,765 full-time and 1,142 part-time workers.

The businesses reported 470 workforce vacancies last January and February when the surveys were taken, underscoring that in the Chesapeake as elsewhere, trained marine tradesmen are in short supply.

“Without an adequate pool of qualified employees, the industry cannot continue to grow and the entire coastal economy will suffer,” Murray says in a report covering the survey results.

The survey was undertaken through the Northern Neck Planning District Commission, with grants from the U.S. Department of Agriculture and the Virginia Department of Community Development.

Murray says the commission is working on a strategy to train and certify more marine workers and encourage more marine business in the Tidewater region. It plans to develop a regional training program on Virginia’s Northern Neck. The program would target its training at businesses in North Carolina, Virginia, Maryland, and New Jersey. Murray says Gov. Mark Warner also has identified the marine industry, along with health care, for future development.

–by Jim Flannery (This article was excerpted from the May 2004 edition of “Soundings: Trade Only.”)
Researchers Link Beach Erosion to Ice Age Channels

If Outer Banks beachgoers give any thought to ice, it’s probably a wish to have more in their coolers. But a new study by VIMS researchers shows that ice plays a much greater role on the Outer Banks than just a means to beat the heat.

The study, conducted by VIMS marine geologist Dr. Jesse McNinch and graduate students Grace Browder and Jennifer Miselis, indicates that Outer Banks beaches likely owe their very shape and behavior to now-buried river channels that formed during the last Ice Age.

Browder presented the team’s findings during a recent meeting of the Geological Society of America.

The research extends an earlier VIMS study of Outer Banks beaches. During that study McNinch discovered a transient phenomenon in which short stretches of sandy beach suffer severe erosion during storms, then quickly refill with sand. These “erosional hotspots” are of great interest to the Army Corps of Engineers and other shoreline management agencies, as they can damage seawalls, hinder beach replenishment efforts, and disrupt military maneuvers.

McNinch’s current research is to better understand the geologic factors that control hotspot formation. It’s based on his previous discovery that hotspots are commonly associated with bends in the offshore sand bars that normally parallel Outer Banks beaches. During storms, these bends act like open gates that allow large waves to pound and quickly erode the shore.

The new research helps explain what causes the bends. Using side-scan sonar, (which uses “acoustic shadows” cast by seafloor objects to map the sea bottom), McNinch and his team discovered that the bends typically occur near where gravel patches interrupt the otherwise sandy seafloor. They then used a high-resolution “chirp” sonar system to “see” beneath the seafloor—and found that the gravel continues beneath the surface in the shape of a stream channel.

The researchers hypothesize that the channels formed during the last Ice Age, when sea level was lower and streams coursed across what is now beach and shallow sea floor. As the ice sheets melted and sea level rose, the gravel-filled channels were buried beneath a thin layer of beach sand.

The team’s next challenge is to understand how a buried stream channel can affect the behavior of overlying sediments and sand bars.

“One idea,” says McNinch, “is that groundwater follows these buried channels, and is somehow affecting the behavior or characteristics of the sediments."

Funding for the work is provided by a three-year grant from the Army Research Office. The study area stretches along the barrier-island beaches of southern Virginia and northern North Carolina.

Recovered Tag Provides Data Windfall

A pop-up satellite tag attached to a white marlin off Venezuela in Fall 2003 by a VIMS research team was retrieved in Aruba by a beachcomber in late March.

“It’s pretty amazing when someone actually finds one of these tags, considering all they go through” says David Kerstetter, who conducts the tagging research along with advisor Dr. John Graves and fellow graduate student Andrij Horodynsky.

The tags log the habitat preferences of white marlin and their rate of survival following release by anglers. They gather behavioral and geographic information for days to months at a time, then automatically release, float to the surface, and transmit the stored data via satellites to scientists on land.

Although these tags represent a significant technological leap, they are not without limitations. One drawback is that satellite data streams typically only transmit about 60% of the information that a tag stores.

The recently recovered tag transmitted only 19% of its more than 9,000 archived data points to the satellites. However, the researchers have successfully downloaded 100% of the data after the tag was returned.

“That’s why physically recovering a tag is such a windfall,” says Kerstetter. To date, 3 of the 70 tags deployed by Graves’ team have been recovered.
Nearly 1,000 people visited Gloucester Point on Saturday, May 22nd to celebrate VIMS’ second annual Marine Science Day open house, with hands-on activities, tours, lectures, and demonstrations for people of all ages.

To view a photo gallery of Marine Science Day activities, visit www.vims.edu/topstories

Photos, clockwise from upper right: Dr. Linda Schaffner explains the Chesapeake Bay food web; a young visitor shows off his recycled fish art; graduate student Todd Gedamke helps a trio of young visitors examine the stomach contents of a barnyard skate; Karinna Nunez instructs GPS treasure hunters in the Boat Basin; and graduate student Bill Metcalfe shines light on a seahorse.

VIMS Celebrates Marine Science Day

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VIMS Honors Castagna

VIMS named the hatchery facility at the Eastern Shore Laboratory in honor of the late Emeritus Professor Dr. Michael Castagna during a June 11th ceremony in Wachapreague. The naming coincided with a visit to the Lab by the VIMS council for their quarterly meeting.

The Castagna Shellfish Research Hatchery honors Castagna for his 42 years of service to VIMS. Castagna passed away on January 18th, 2004 after a long illness. He is survived by his wife Mary; his daughter Kathy Anderson; sons Michael, Robert, and John; and nine grandchildren.

Castagna began working at VIMS in 1962 when Dr. William J. Hargis hired him to direct the newly established Eastern Shore Lab (ESL).

“That was no small task,” says current ESL Director Dr. Mark Luckenbach. “Mike had to begin by literally building the lab. Lacking much of a budget, he and his small staff actually did most of the construction work themselves.”

In the decades that followed, Castagna led the lab to an international reputation for its work in molluscan biology and aquaculture. He is widely credited as a founding father of hard clam aquaculture on the East Coast, an industry now valued at nearly $100 million.

“Mike made a tremendous contribution in building and running the lab,” says Luckenbach. “He unselfishly gave his time, energy, and knowledge to make this field station a valuable resource for VIMS and the College.”

Since his retirement in 1992, Castagna remained active in research, outreach, and service to professional societies.

“Mike will be greatly missed by his many colleagues and friends,” says Luckenbach. “We trust that bestowing his name on the hatchery will help remind us on a daily basis of his many contributions.”

VIMS Volunteers Support Blue Crab Bowl

A large group of VIMS faculty, staff, and students volunteered during the 7th Annual Blue Crab Bowl at Old Dominion University on February 28.

“As always, our VIMS and ODU volunteers did a beautiful job preparing for and participating in the 2004 competition,” says Marine Education Specialist Susan Haynes. “Their dedication and enthusiasm is what makes this event such a great success.”

VIMS volunteers served as moderators, science judges, scorekeepers, timekeepers, and team challenge-question graders.

The Blue Crab Bowl, which is hosted by VIMS/Virginia Sea Grant and ODU’s Center for Coastal Physical Oceanography, is one of 24 regional U.S. competitions that lead up to the annual National Ocean Sciences Bowl each spring.

Both the regional and national events are timed competitions for teams of high school students that involve critical thought questions and “rapid recall” responses. Questions cover the biology, physics, geology, and chemistry of the oceans as well as marine geography, technology, history, and current events.

The winner of this year’s Blue Crab Bowl was Thomas Jefferson High School for Science and Technology of Alexandria. Second place honors went to Chesapeake Bay Governor’s School, Glenn’s Campus, which includes several local students from Gloucester High. The first place team won a day-long research trip aboard ODU’s R/V Fay Slover and the coach received a Virginia Sea Grant scholarship to attend the 2004 National Marine Educator’s Conference. The second place team received a whale-watching trip donated by the Virginia Marine Science Museum.

Blue Crab Bowl winner Thomas Jefferson High competed in the 7th annual National Ocean Sciences Bowl in Charleston, South Carolina in April, where they made a valiant first-round showing against the eventual champions, Mission San Jose HS (California).
VIMS researchers Dr. James Bauer and Sasha Tozzi are co-authors of a new article concerning silica’s role in the ocean’s response to iron enrichment. Sprinkling iron onto the ocean surface has been touted as one way to help curb global warming, based on the idea that this iron “fertilizer” can boost the rate at which marine plants remove carbon dioxide from the atmosphere.

The multi-author article appeared in the April 16th issue of Science. The work was part of SOFeX (the Southern Ocean Iron Experiment), one of the largest oceanographic experiments ever mounted. This two-year collaborative effort brought 3 ships, 45 tons of equipment and supplies, and 17 leading U.S. oceanographic institutions to the waters around Antarctica. VIMS researchers Drs. Walker Smith and Hugh Ducklow and their graduate students were also involved in the project.

Silica is a key element in iron enrichment because marine plants called diatoms use it to build their “shells.” Earlier studies have shown that diatoms are the plants that grow fastest when iron is added to polar waters. When the relatively large and heavy diatoms die, they quickly carry the carbon in their tissues to the deep sea, where it may remain for thousands of years and thus play no role in global warming.

Antarctica’s Southern Ocean, where the experiment took place, is the most likely site for any future large-scale iron-fertilization projects, as it is the world’s largest iron-poor ocean region and outside busy shipping lanes. The SOFeX researchers wanted to know what would happen if iron was added to the large parts of the Southern Ocean with little silica. They thought the lack of silica might favor blooms of other types of marine plants that don’t need the element. Because these kinds of plants are typically smaller and lighter than diatoms, they sink more slowly when they die. This gives other marine organisms a greater opportunity to recycle the carbon in the plants’ tissues back into atmospheric carbon dioxide, foiling any promise of a quick-fix to global warming.

To test their ideas, the researchers created one iron patch in a silica-poor area north of Antarctica, and a second in a silica-rich area nearer the continent. They then measured how much of the carbon from the two patches sank to the ocean depths when the iron-fertilized plankton died or were eaten.

The results were surprising. The researchers had expected that more carbon would descend beneath the southern patch where added iron and native silica supported a dense diatom bloom. Instead, they found that carbon “export” beneath the two patches was elevated to a similar degree.

“Although the northern, silica-poor patch supported fewer diatoms, we also measured significant carbon export there,” says Bauer. “Together, these results show that iron truly is one of the key limiting trace nutrients in these waters.”

The study was supported by grants from the U.S. National Science Foundation and Department of Energy.

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VIMS Launches Real-Time Data Buoy

An interdisciplinary team of VIMS researchers and technicians launched a new data buoy into the York River on April 9th. The buoy is now streaming real-time images back to the VIMS website and sending data updates every 15 minutes.

Funds to deploy the buoy came from Congress through a one-year collaboration between VIMS and the U.S. Coast Guard. One aim of the project is to learn how to better use buoy data, along with computer models, to support search and rescue operations.

On a broader scale, VIMS researchers see the deployment as an initial step toward expanding the Chesapeake Bay Observing System (CBOS) into the lower Bay. CBOS is one part of an array of ocean observing systems springing up along the U.S. coastline. Other local and regional systems include GoMOS in the Gulf of Maine, SEA-COOS along the Southeast Atlantic coast, TABS in the Gulf of Mexico, and SCCOOS on the West Coast.

“These regional systems are the building blocks of a larger movement to create a national and international ocean observing system,” says VIMS physical oceanographer Dr. John Brubaker, who helps lead the Coast Guard project.

A goal to develop a national ocean observing system is one of the main recommendations of the U.S. Ocean Commission’s recent report (see story on p. 1).

Brubaker, along with colleagues Carl Friedrichs and Don Wright, has spent the last several years working with technicians Todd Nelson and Ned Burger and graduate students Lorraine Brausser and Art Trembanis to develop communications and data management subsystems and to implement the sensors that now adorn the 10-foot-tall, solar-powered buoy. Initial funds to purchase and outfit the buoy came from the General Assembly.

The buoy’s data sensors measure wind, air and water temperature, salinity, pH, chlorophyll levels, and dissolved oxygen. The team is currently working to add an Acoustic Doppler Current Profiler to the mix. The ADCP uses sound waves to measure the speed and direction of currents throughout the water column and also determines wave conditions at the water surface. A two-way radio connection allows VIMS researchers to control the sampling remotely.

Brubaker notes that information on currents and waves is of special interest to the Coast Guard.

“One estuarine like Chesapeake Bay pose unique challenges for search and rescue operations,” says Brubaker. “If someone goes over, the Coast Guard needs to know their likely path so they can organize a search. In tidal waters the current could carry a person or disabled boat one way for a few hours, then reverse, and they need to keep track of that. They already have some tools, but they are always looking for better information on tides and currents.”

A key to providing accurate predictions of current speed and direction is to pair the buoy with a high-resolution computer model that can extrapolate from the buoy’s single-point data to a prediction of currents throughout the lower Bay.

“Integration with models is crucial,” says Brubaker. “The buoy data helps keep the model on track. With the model we have a fine grid, a mesh of points that covers the York River and Chesapeake Bay. In principle with that we can give information almost anywhere in the River and the Bay.”

VIMS models Drs. Jian Shen, Harry Wang, and Courtney Harris provide the modeling expertise for the Coast Guard project. They have already refined the model to predict tidal height, and are now testing and calibrating it to accurately predict currents.

The buoy’s imaging capabilities are also of great interest to the Coast Guard. The buoy features a camera that captures pictures rapidly enough to create near video-quality moving images. These are instantly available to VIMS researchers via a 2.4 gigahertz wireless connection.

“The first thing the Coast Guard asked us for was the camera images,” says Brubaker. “It just may be that during the time leading up to a boating accident our camera might capture an image of the boat passing by.”

The camera can also be useful for homeland security. “The images have a value totally separate from search and rescue, just keeping track of vessel traffic in general,” says Brubaker.

Now that the Coast Guard project is nearing its end, VIMS researchers are turning their attention toward securing the funds to continue its operation. “We now have the core infrastructure for the observing system in place and we’re still learning about what the potential and possibilities are,” notes Brubaker.

To view real-time data from the VIMS buoy, visit www.vims.edu/realtime/
Hale Takes PBDE Research to the Air

Ospreys are once again harbingers of spring across Chesapeake Bay, thanks largely to regulation of DDT and other pesticides that had devastated the species’ population during the mid-1900s. But the emergence of new environmental contaminants, including flame-retardant compounds known as PBDEs, is raising concern among scientists who study the birds. VIMS Professor Dr. Rob Hale, a leading authority on the behavior of PBDEs in the environment, is collaborating with avian experts from around Chesapeake Bay to determine the exposure of osprey to these new contaminants, and to traditional pollutants such as DDT, PCBs, and mercury.

Hale’s collaborators include Research Associate Reese Lukei of the Center for Conservation Biology (CCB) at William & Mary, as well as scientists at the Patuxent Wildlife Research Center, the U.S. Fish and Wildlife Service, the University of Maryland, and the U.S. Department of Agriculture.

Results of their research appear in the latest issue of the Archives of Environmental Contamination and Toxicology.

Hale is also teaming with CCB and W&M undergraduate Catherine Potter to study the effects of PBDEs on peregrine falcons. Because peregrines feed on other birds of prey from their perch atop the food web, researchers suspect they may be especially likely to concentrate contaminants in their tissues (see sidebar).

Hale’s role in the osprey study was to analyze PBDE levels in eggs taken from nests along the Elizabeth River, Baltimore Harbor, and the Anacostia, Patapsco, and mid-Potomac rivers.

These are some of the most highly polluted areas of Chesapeake Bay. The researchers removed a single egg from nests in these sites and compared their contaminant levels with eggs taken from nests along tributaries thought to be largely contaminant-free (a typical osprey nest contains three eggs).

They also followed the fate of the remaining eggs until they hatched and the chicks fledged. Ospreys in all but one of the contaminated sites showed only marginal success in breeding. Nests in the Elizabeth River and the pristine sites were sufficiently productive to maintain the local population.

Analysis of eggs from the contaminated sites showed that they often contained higher concentrations of PBDEs, PCBs, and DDE (a breakdown product of DDT) than eggs from the pristine sites. There was, however, no clear statistical correlation between individual contaminant concentrations and nesting success.

“There are likely additional factors at play that preclude a simple correlation between contamination levels and nesting problems,” says Hale. “There may be other contaminants that we didn’t sample for, or some of our known contaminants may have already been transformed by organisms and eliminated. Habitat loss probably also plays a role.”

The migratory nature of many of the osprey’s fishy prey, together with the bird’s extensive hunting range, may also help explain the lack of a clear correlation.

Most troubling, notes Hale, is that PBDE concentrations appear to be increasing in the osprey population. Levels are now four times higher in the Anacostia and Potomac rivers than in pristine sites.

Previous laboratory studies by Hale and graduate student Mark La Guardia show that exposure to PBDEs can alter reproduction and nervous-system development in many organisms.

For more about Rob Hale’s work on PBDEs, visit www.vims.edu/env/research/envchem.html and the Fall 2001 issue of The Crest.

Faculty Help Launch Scholars Program

VIMS faculty helped inaugurate the new Hall-Bonner scholarship program during a ceremony at Hampton University on April 30.

The program is designed to increase the number of under-represented minority students earning Ph.D. degrees in marine and ocean sciences. It builds on the recognized strengths in graduate-level marine education at VIMS and Old Dominion University. Faculty will mentor Hall-Bonner scholars through the normal Ph.D. curricula at either VIMS or ODU. The students will also take additional specialized courses at Hampton University.

The Program, which provides full support for tuition and stipends, is named for leaders in establishing marine science education at Hampton University—the late professor Anita Hall and the retired dean of the school of science, Dr. Robert Bonner. It is supported by a $1.1 million award from the National Science Foundation.

Pictured from L are Dr. Gene Burreson and his student Ms. Delonna White, Dr. Linda Schaffner and her student Ms. Treda Smith, Mr. Leonard Pace, Dr. Rom Lipcius, and Ms. Andrea Roche and her advisor Dr. Margaret Muholand (ODU). Not pictured are Dr. Jack Musick (mentor to Mr. Pace), Dr. Mike Newman and his student Ms. Erica Holloman, and Dr. Lipcius’ student Mr. Justin Falls.

Preliminary research by Dr. Rob Hale and W&M undergraduate Catherine Potter is helping to throw light on the potential effects of PBDEs on peregrine falcons.

An endangered species, peregrines suffered dramatic population declines at the hands of pesticides in the years following WWII. By the early 1960s all known breeding pairs east of the Mississippi had disappeared.

Restoration efforts, including significant work by the Center for Conservation Biology (CCB) at William & Mary, have helped to re-establish a peregrine population in Virginia. In 2001, CCB staff counted 16 breeding pairs of peregrines in Tidewater.

Hale and Potter are hoping that their research will help this nascent population maintain its upward but erratic course by identifying any contaminants of concern before they might begin to affect the bird’s reproductive success.

Potter, who is pursuing the research for her senior thesis in Chemistry, has found that the thickness of peregrine eggs decreases with increasing PBDE concentration. Hale notes that Potter’s results confirm previous work from Sweden.

“Catherine’s research also shows the great opportunities for collaboration between VIMS scientists and undergraduates on the main campus,” adds Hale.

For more information on CCB’s peregrine restoration program, visit fsweb.wm.edu/ccb/index.html
School of Marine Science Admits Class of 2004

The School of Marine Science at VIMS has completed the selection process for the incoming class of 2004, tending offers of admission to 47 of the 152 students who applied.

To date, 70 percent of those offered admission have enrolled at VIMS. “That’s an impressive figure,” says Dean of Graduate Studies Dr. Iris Anderson, “as we compete with all the other leading marine science graduate schools for students.”

About 60% of the incoming students will work toward a master’s degree, while the remaining students will seek the Ph.D. Seventy percent of the incoming students are from outside Virginia.

One striking feature of the incoming class, notes Anderson, is the relatively small percentage of international students. Students from outside the U.S currently make up about 12 percent of VIMS’ enrollment, but the incoming class comprises only 2 foreign students (6%).

Anderson attributes the decline to tougher immigration rules that require faculty to guarantee funding to foreign students for the entirety of their graduate career. “That’s a difficult promise to make,” says Anderson, “particularly in a time of shrinking budgets.”

Another change from previous years is the high percentage of females in the incoming class. “Women make up 70% of our incoming students,” says Anderson. The current student body is about equally split between males and females.

VIMS Finds Pathogen in Non-native Oysters

VIMS scientists have discovered an unexpected parasite in non-native oysters Crassostrea ariakensis being held in Bogue Sound, North Carolina.

The parasite appears to be an undescribed species in the genus Bonamia, a group of single-celled protozoans that infect oyster blood cells. Known species of Bonamia occur in oysters in France and New Zealand where they cause significant mortality. Although Bonamia is known to occur in a small population of European flat oysters introduced and established in Maine, the parasite has never been reported in the mid-Atlantic area.

Dr. Eugene Burreson announced the discovery of the parasite in December 2003 during a regional meeting at VIMS of scientists who are conducting studies on the non-native oyster. Burreson reported that 60% of the oysters in two recent samples had light infections. The parasite was first observed in routine histological sections and its identity was confirmed with DNA-based diagnostic tools.

Oysters from the same spawn held in the Chesapeake Bay do not show the infection and it has not been observed in more than 1,000 non-native oysters examined to date by VIMS from Chesapeake Bay or the coast of Virginia.

“The big mystery right now is where this parasite is coming from,” said Burreson. “It seems that oysters are acquiring the parasite from something in Bogue Sound, but we have no idea what the source animal is.” The parasite has never been observed in native oysters anywhere along the East Coast.

It is unclear at this point if the parasite will cause mortality in C. ariakensis, but other similar parasites are very pathogenic to their hosts. Studies are underway to determine mortality, source of infection, and also to determine if the parasite can survive in lower salinities typical of Chesapeake Bay.

Non-native oysters have performed well against MSX and Dermo, the diseases that have decimated Chesapeake Bay oyster populations, but this new finding is cause for concern. If the parasite causes mortality and can survive at Chesapeake Bay temperatures and salinities, it may limit usefulness of C. ariakensis for restoration of the oyster resource.

“This doesn’t seem to be an issue of C. ariakensis introducing an exotic disease to the native oyster, it is an issue of a local parasite causing problems in C. ariakensis,” said Burreson.

Explore the Bay with CBNERRVA

The Chesapeake Bay National Estuarine Research Reserve in Virginia (CBNERRVA), in partnership with York River State Park, is offering free educational boat trips in the York River and Taskinas Creek this summer.

Professional field educators will lead hands-on activities highlighting the plants and animals of these waterways. Taskinas Creek is one of four CBNERR sites in Virginia.

York River Marine Biology Boat Trips
Saturday, June 19
Join this trip on a VIMS vessel to collect York River animals using crab pots, habitat cages, a plankton net, and a trawl net. Trips will run from the floating dock in Taskinas Creek. 11am – 12:30pm OR 1pm – 2:30pm.

Tour of the Reserves Canoe Trips
Wednesday, July 28
Thursday July 29
Wednesday, August 18
On these trips, participants will take a 5-hour canoe trip through Taskinas Creek and the nearby York River to explore the salt marsh and collect estuarine animals using seine nets. 9:30am – 2:30pm.

Study Reveals Sharp Drop in SAV

VIMS’ annual analysis of submerged aquatic vegetation (SAV) in Chesapeake Bay shows a significant decline in bay grass coverage during 2003. The 30% decrease recorded by VIMS researchers offsets significant increases in bay grass acreage measured during the previous few years of drought.

Scientists at VIMS and elsewhere around the Bay attribute the decline to last summer’s heavy rains and cloudy weather. Near-record river flows in 2003 washed large amounts of nutrients and sediments into the Bay, which combined with cloudy, rain-filled days to hinder the growth of the Bay’s underwater grasses.

VIMS measured 64,709 acres of underwater grasses in 2003, significantly lower than the previous year’s record level of 89,659 acres. The 2003 total represents just 35% of the 2010 restoration goal of 185,000 acres set by the Chesapeake Bay Program (CBP).

“Nature continually reminds us that SAV is very sensitive to water quality,” says Dr. Robert Orth, who heads VIMS’ annual bay grass survey.

“Acreage fluctuations over the past two years reinforce the message that SAV can rapidly rebound when conditions improve, but also decline just as rapidly when conditions worsen as they did in 2003.”

“Wet and dry years have become proxies for the problems that face the Bay and what we hope the Bay can be,” adds Dr. Ken Moore, who along with Orth heads VIMS’ SAV program.

The Chesapeake Bay Program uses the VIMS data to track progress toward its SAV restoration goals. VIMS researchers base their yearly report on analysis of more than 2,000 aerial photographs.

For more information on VIMS’ SAV program and data, visit www.vims.edu/bio/sav

To reserve space for these programs or for more information, contact York River State Park at yorkriver@dcr.state.va.us or 757-566-3036. Space is limited. Participants must sign up in advance and fill out a health form and liability waiver. Everyone must wear sneakers or sturdy sandals that can get wet and muddy and sign in for trips 15 minutes prior to departure time. Children must be at least 50 pounds. York River State Park parking fee is $3 per car on the weekend and $2 per car on weekdays. Trips are weather dependent.
Dr. Jack Musick, Acuff Professor of Marine Science at VIMS, recently led 12 graduate students on his “Roanoke Round-up,” an annual field trip to western Virginia to study fish evolution in Appalachian rivers and streams.

Musick has offered this trip, where he not only teaches but cooks all the meals, for 35 consecutive years.

“The Round-up is important because it allows students the opportunity to see evolution in action,” says Musick. “The geology of the central Appalachians makes an ideal environment for learning how fish change and adapt for survival.”

Streams in western Virginia flow through limestone mountains to reach major river systems throughout the middle and eastern United States. Some feed the Tennessee system west to the Mississippi, some flow to the Atlantic Ocean, and some feed into the Ohio. Fish in these rivers came from the same ancestral stock, but have evolved in isolation, resulting in new species with subtle yet distinct differences. When erosion causes the headwaters of one stream to cut through the limestone of a mountain ridge into the next valley (a process called stream piracy), the fish populations of one river system mix with those of another.

The mixing of closely related but previously isolated fish species raises the possibility of cross breeding, but the low survival rate of hybrid offspring has led to the evolution of mechanisms to facilitate mating within a species. Minnows and darters in the clear waters of Appalachian streams find mates of their own species in the same way as tropical fish and birds—by sight.

“Each spring, when it’s time to mate, the males take on brilliant species-specific colors,” says Musick. “So although closely related species have the same body and fin shape, individual species can be recognized by the decoration of bright blues, reds, yellows, and oranges.”

In the early years of the Round-up, Musick’s group would camp in tents in collaboration with Roanoke College. Now the group stays in the University of Virginia’s Mountain Lake Field Station. This venerable facility, originally built in the 1930s, now has modern kitchen facilities and electricity, allowing students to complete lab work in the evening in all types of weather.

“The rolling hills, redbuds and dogwoods in full bloom, and the gourmet meals (which only occasionally include fresh roadkill) are all just bonuses for the trip,” Musick adds with a grin. “It’s a very special event.”

NOAA Honors VIMS Alumnus

The National Oceanic and Atmospheric Administration (NOAA) presented VIMS alum Thor Lassen (M.S. 1983) with an Environmental Hero Award on Earth Day for his outstanding efforts to promote grassroots environmental stewardship and habitat restoration in support of the NOAA Community-based Restoration Program (CRP).

Established in 1995 to commemorate the 25th anniversary of Earth Day, the Environmental Hero award is presented to individuals and organizations that volunteer their time and energy to help NOAA carry out its mission.

Lassen, who founded the grassroots conservation organization Ocean Trust in 1992, is working through Ocean Trust’s partnership with the NOAA CRP to respond to a significant fisheries habitat restoration challenge at the Bahia Grande in south Texas. The project will restore tidal flow to the Bahia Grande is scheduled for this summer.

Lassen grew up in Hampton and earned a M.S. degree from VIMS in 1983, where he studied striped bass management in Chesapeake Bay under Dr. Herb Austin and N. Bartlett Theberge, Jr. Since graduating from VIMS, Lassen has served as a Sea Grant fellow, a representative of the Atlantic States Marine Fisheries Commission, the Executive Secretary for the National Council of Fishing Vessels Safety and Insurance, and in a variety of capacities with the National Fisheries Institute, the National Fisheries Education and Research Foundation, and the East Coast Tuna Association.

Real-Time Buoy Data

Water and air measurements from VIMS’ recently deployed data buoy are now available on the web in near real-time. VIMS researchers are using these data to improve predictions of physical and biogeochemical phenomena in lower Chesapeake Bay. Accurate and timely forecasts of Bay dynamics can help government agencies better manage natural resources, plan for extreme events, facilitate maritime operations, and advance science and education.

Visit www.vims.edu/realtime/ (as well as the article on page 5).

Alumni Pages

These pages help VIMS alumni stay connected to one another and to current VIMS students and events. An online directory lists the name, graduation date, major advisor(s), degree, and thesis or dissertation topic for 749 alumni of the School of Marine Science. Alumni are encouraged to visit the on-line guestbook and sign in if they have not already done so.

Visit www.vims.edu/alumni/

Non-native Oyster Trials

This site provides regular updates on VIMS’ effort to monitor the Virginia Seafood Council (VSC) trial of sterile C. ariakensis oysters. The VIMS monitoring program, which is independently funded by NOAA, is designed to ensure that the VSC test meets the highest standards of science and biosecurity. Data on the web site track the status of the oysters at each of the eight commercial grow-out sites, and also provide updates on a parallel experiment with a sterile, disease-tolerant strain of the native oyster C. virginica. The Virginia Marine Resources Commission approved the VSC trial in February 2003 to help further explore the economic potential of this non-native species for aquaculture in Chesapeake Bay.

Visit www.vims.edu/vsc/
## Calendar of Events

### June 2004
- 5, 12, 19, 26 Summer Saturdays at VIMS
- 11, 18, 25 VIMS Public Tours
- 21 - July 23 Governor’s School
- 24 After Hours Lecture
- 28 - 30 Master Oyster Gardeners/ Oyster Workshop for Teachers

### July 2004
- 2, 9, 16, 23, 30 VIMS Public Tours
- 6 SWCD “From Your Backyard to the Bay” Day Camp
- 8 Guild of Natural Illustrators Tour
- 12 MAST (Minorities at Sea Together) Visit
- 12-14 Genetics Course for Teachers (see pg 5 for details)
- 16 W&M Star Program
- 20 HACE (Hourly and Classified Employees) Tour
- 21 Tidal Wetlands Symposium
- 29 After Hours Lecture (Marine Biodiversity)

### August 2004
- 6, 13, 20, 27 VIMS Public Tours
- 10 Nauticus Oceanography Camp
- 23 Orientation for New Students
- 25 SMS Classes Begin
- 25-27 Exploring Chesapeake Bay Habitats / Middle School Students Field Course
- 26 After Hours Lecture (Seahorses)

### September 2004
- 22 VIMS Council Meeting
- 22 Maury Society Dinner (tentative date)
- 30 After Hours Lecture

### October 2004
- 8 VIMS Associates Day

For more information call 804/684-7101 or 804/684-7846.

### VIMS Hosts Raft-Up

Boaters from the James River to the Potomac participated in VIMS’ first-ever Raft-Up Rendezvous at Fishing Bay Yacht Club in Deltaville on May 8-9. The 225 attendees were educated and entertained by research experts Stan Allen, John Graves, Jesse McNinch, and Betty Neikirk.

“These scientists and several enthusiastic graduate students did a great job of presenting information about biological sciences, fisheries, marine geology, and aquaculture,” says event coordinator Mimi Beckwith.

After a day of education and a silent auction of items such as fishing trips, oyster tastings, and canoe trips, event participants stayed for a cookout and music by Zion Wave. Many returned on Sunday morning to discuss what they had learned and make suggestions for next year’s event.

“We greatly appreciate the corporate and individual donors who made the Raft-Up possible,” notes Beckwith. Event sponsors were the Bank of Lancaster, Bill Hudgins Pontiac GMC, Inc., Chesapeake Yacht Sales, Peter M. Clay, John W. Dayton, Kanawha Land Company, Pirates Cove Marina, and SunTrust Bank.

“We also send special thanks to Fishing Bay Yacht Club and all of their members who provided a beautiful site and helped make the event such a success,” says Beckwith.

### Visit our website at www.vims.edu

VIMS alumni gather at the Graduate Student Association’s annual Spring Party April 17 during the first annual VIMS alumni weekend. The event brought more than 30 alumni and their families to Gloucester Point for VIMS’ awards ceremony, a campus tour, and a canoe trip. Photo by Mike Ryan.

A Benefit Art Show and Auction featuring the nationally acclaimed wildlife sculpture of William and David Turner brought 180 people to the VIMS campus in Gloucester Point on April 30. The event raised approximately $20,000 for the Hargis Library Endowment. Pictured from L are W&M alumnus Alvin Anderson, Mickey Blandford, VIMS Council member Cameron Blandford, W&M alumna Carol Wright, and Ms. Betsy Anderson.

Guests arrived at the VIMS Raft-Up by sailboat, power boat, and dinghy. During the event, participants had the opportunity to tour the new VIMS landing craft, The Pelican, docked on the left in the photo.