

FY2010 Operating Budget Testimony

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Introduction

I am honored to come before you today as president of UMBI for my 10th consecutive year. As this is my last testimony as president of UMBI, I express my sincere thanks to Members of the Maryland General Assembly, and to Governor Martin O'Malley, for all of the guidance and support you have provided to UMBI. I want to share some of our measurable successes in biotechnology research, commercialization, and education in FY08. I would also like to outline key management initiatives that are designed to foster growth in biotechnology, both at UMBI and in the State of Maryland, in the difficult financial climate that we face going forward.

At UMBI, our mission is to conduct groundbreaking research in key areas of biotechnology, to make fundamental discoveries, generate innovative solutions to practical problems, and develop new technologies for commercial application. As the only Maryland research institution focused entirely on biotechnology, we also provide a unique environment for mentoring and training the biotechnology workforce of tomorrow. We have adhered to these interlocking missions for 23 years. By so doing, we have helped Maryland's economy to thrive while providing the opportunity for the people to participate in a vital industry whose relative contribution to the 21st century "knowledge economy" will continue to grow.

The past year has provided an acid test of the fundamental soundness of UMBI. Our country and consequently, the State of Maryland are in a once in a lifetime fiscal crisis that will require shared priorities as well as shared sacrifices. This was also a year in which scientific institutions across the United States, the most elite and respected among them, have struggled to maintain their footing as both Federal and State budgets were trimmed in response to broadening economic distress. We have not come through this unscathed. Consequently, we have not been able to afford to bring in the new scientific talent that we need for our developing programs.

What we have been able to do is to continue to expand our role in offering solutions to critical problems facing society such as climate change and the need for alternative energy sources. We have been able to expand our role in workforce development and K-12 education. We continue to obtain federal grants at higher than average levels. I am pleased and proud to report that in the midst of this general environment of retrenchment, UMBI brought in contract and grant awards totaling \$26.0 million, and non-state revenues were drawn from nearly 60 different sources. This represents a 9.3% increase over the prior FY07 awards and an increase over the last several years in a very competitive climate given how the federal funding agencies funding has decreased.

I believe this outcome serves to illustrate the unique aspects of UMBI that stabilize our position in relation to other research institutions. UMBI is the

biotechnology institution of the University System of Maryland (USM). USM functions in a spirit of partnership with the State of Maryland, to expand educational capacity, increase educational quality, and increase accessibility while holding down costs. Continued investment in both higher education and biotechnology research will provide major solutions to the problem of restimulating the economy. It is because of our international reputation that UMBI is the first institution in the United States to be receiving in FY09 funding from the European Union from their scientific research program for research to be done in the United States, specifically in Maryland.

We have a mandate to coordinate and lead biotechnology throughout the State of Maryland and its university system. During FY08 we served as advisors to the Governor's Life Science Advisory Board. We have earned a reputation for flexibility and for eschewing bureaucracy. Time and time again, we have shown that we can respond quickly to the needs of a broad range of stakeholders. Our reputation is one of bring problem-solvers who deliver on time, meet our objectives, and work creatively with others to advance bioscience. Going forward, we plan to focus on certain areas of our research strengths, which we have recently recognized as "Signature Areas" in addition to supporting our outstanding faculty members individual research programs.

UMBI's Centers of Excellence

UMBI consists of four research and one virtual collaborative research center:

The Center of Marine Biotechnology (COMB), located in Baltimore, applies the tools of modern biology and biotechnology to study, protect, and enhance marine and estuarine resources. COMB has an international reputation of excellence in several key areas of marine biotechnology including aquaculture and fisheries biotechnology, marine functional genomics, natural products and pharmaceuticals, microbial processes and environmental biotechnology.

The Medical Biotechnology Center (MBC), located in Baltimore, is an integrated, multidisciplinary center. MBC focuses on molecular signaling and biophysics to advance knowledge in biomedical research and applications by studying the molecular and biochemical basis for a number of prevalent diseases in human health including heart failure, Huntington's and Alzheimer's disease.

The Center for Advanced Research in Biotechnology (CARB), located in Rockville, applies theoretical and experimental approaches to the structure, function, design and evolution of biological macromolecules. Formed through a partnership with the National Institute of Standards and Technology (NIST), CARB scientists advance the state-of-the-art in measurement science as it relates to *in vitro* and *in vivo* interactions between biomolecules.

The Center for Biosystems Research (CBR) located in College Park, addresses fundamental biological problems in complex biological systems using a comparative approach to study the biology of pathogens, infection, and the host response in plant and animal systems.

The Appalachian Center for Ethnobotanical Studies (ACES) is currently a “virtual center” formed by a partnership between Frostburg State University, West Virginia University, and UMBI. A primary focus of ACES is to foster economic growth in the region through the managed development of the area's natural resources. ACES’ mission is to work with existing businesses to explore the use of regional plants for health-related purposes. ACES also helps to document and preserve Appalachian culture as it relates to wild plant harvesting and herbal medicine through community outreach and education programs. The goal of ACES is to develop a physical facility within the next five years that will be located in Western Maryland and will house a conference center, a museum/education center, and a research center.

UMBI Addresses Societal Needs

UMBI is dedicated to research and development that provides concrete solutions to real-world problems that face society. One major area is development of new sources of clean, renewable energy from biological materials. In his economic initiatives, President Barack Obama has emphasized the importance of switching to energy sources that will preserve the environment and slow climate change while breaking our dependence on foreign oil imports. Several scientists at UMBI are at the cutting-edge of these critical efforts.

Here are a few examples of how UMBI’s research programs apply the tools of biotechnology to societal needs:

Bioprospecting for Ethanol and Butanol

UMBI/COMB was awarded a \$575,000, three-year subcontract award from the University of California at Berkeley to develop more efficient ways to convert lignocellulose—found in waste materials from wood products—into biofuels such as ethanol and butanol. The subcontract is part of a collaborative research and development effort designed to improve the efficiency of biofuel production.

Capturing Excess Electrons from Photosynthesis

It is hard to match the efficiency of nature when it comes to renewable energy—as exemplified by the conversion of sunlight into energy by photosynthesis carried out in green microbes and plants. In fact, under certain conditions, cyanobacteria produce so much energy that they need to get rid of the excess high-energy electrons that they carry. UMBI is finding ways to capture this excess energy and use it to generate electrical powered microbe-powered fuel cells.

Saving the Blue Crabs of the Chesapeake Bay

UMBI's Center of Marine Biotechnology continues to play a leadership role in the Blue Crab Advanced Research Consortium (BCARC), which involves collaboration with the Maryland Department of Natural Resources (DNR), the Cooperative Oxford Laboratory (National Oceanographic and Atmospheric Administration and DNR), the Smithsonian Environmental Research Center, the Virginia Institute of Marine Sciences, North Carolina State University, the University of Southern Mississippi, the Maryland Waterman's Association, Philips Seafood, and consultant Ken Leber of the Mote Marine Laboratory. Ongoing work was highlighted with the publication of eight BCARC manuscripts in the Reviews in a special volume of Reviews in Fisheries Science in 2008.

Rescuing Commercial Fisheries While Providing High-Quality Protein to Feed the World

Global commercial fisheries have declined in recent years while the world's population continues to grow. A 2006 paper in the journal *Science* has predicted a total collapse of commercial fishes and seafood species by the year 2048 if current trends are not reversed. Intensive fish farming in coastal and open ocean net pens is also widely viewed as detrimental to the environment, and operations are vulnerable to pollution and endemic diseases. To solve this problem, UMBI/COMB has developed an alternative land-based, marine recirculating aquaculture system. This method of urban fish farming has virtually no environmental impact as it is fully self-contained. Wastes are recycled and removed by beneficial microbes, and methane gas is captured as an alternative eco-friendly energy source. The result is large-scale, clean, healthful, and high quality fish harvests that are commercially competitive, environmentally friendly, and site-independent. Prototype systems have been validated, a business plan has been developed, and we are currently looking for investors to take this breakthrough technology to the marketplace. UMBI/COMB was awarded \$670,000 in two grants from NOAA to further develop this technology for hatchery to market-size production of cobia - a high value marine fish.

Controlling Antibiotic-Resistant Pathogens with Their Natural Enemies

Deadly, multi-drug resistant strains of bacteria, such as *Streptococcus* and *Staphylococcus*, have become a major and rising threat to global health. UMBI/CARB scientists are using bacteriophages, naturally-occurring viruses that prey on these harmful bacteria, as a means of developing effective alternatives to traditional antibiotics. The bacteriophages, which are harmless to other species, contain enzymes that break open and kill the deadly bacterial cells. Research demonstrates that the pathogenic bacteria do not become resistant to these naturally-occurring viruses which offer a safe and effective way of controlling these deadly diseases. The enzymes that are released by these bacteriophages are of special interest both as alternatives to antibiotics and also as eco-friendly disinfectants.

Controlling Malaria with Biotechnology

Each year, an estimated 500 million people contract malaria, and one to three million people die from the disease - as many as one child every 30 seconds. UMBI's CBR facility have teamed up with Sanaria, a company that is developing new malaria vaccines. To manufacture the new vaccines, Sanaria needs mosquitoes whose salivary glands are loaded with the parasites. UMBI was awarded a small business (SBIR) grant with Sanaria to facilitate these efforts. This research complements UMBI's ongoing efforts to find new ways to control the natural mosquito populations by genetically modifying mosquitoes so that they cannot harbor the malaria parasite.

Ultra-Rapid, Ultra-Sensitive, Life-Saving Diagnostics with Metal-Enhanced Fluorescence

When the offices of two U.S. Senators received envelopes containing an unidentified white powder, it took over 48 hours to determine that the envelopes contained deadly spores of anthrax bacteria - a long time to wait. UMBI/MBC faculty have applied their powerful technology, Metal Enhanced Fluorescence (MEF), to make this determination in just 20 seconds. MEF has become the most rapid and sensitive diagnostic technology available and is widely applicable to a broad range of biological materials including proteins and DNA. The method also has life-saving applications in point-of-care diagnosis of heart attacks in progress and sexually transmitted diseases.

Designer Drugs Against HIV, the AIDS Virus

The HIV virus that causes AIDS is notorious for rapidly acquiring mutations its genetic code that make it resistant to anti-HIV drugs. UMBI's CARB faculty members have brought powerful techniques of structural biology to bear on the problem. The trick here is to design new drugs that closely resemble the three-dimensional size and shape of the viral proteins they inhibit. One critical target is the HIV protease. Our scientists have shown that drugs that conform closely to the structure of the HIV protease are less sensitive to HIV mutations, because those mutations also destroy the ability of the target protease to function, and the virus cannot replicate. This approach can lead to development of more effective, long-term treatments for AIDS.

Stem Cell Research

Four scientists from UMBI's MBC center have active stem cell research awards focused on using stem cells to fight heart disease and neurodegenerative diseases. These awards will collectively bring in \$2.4 million in revenues to UMBI. The awards are sponsored by the Maryland Stem Cell Research Fund (MSCRF) and administered by the Maryland Technology Development Corporation (TEDCO).

External Review Recommendations: Greater Integration and Collaboration

IN FY08 UMBI conducted an external review to see if our direction and current model of operations are maximizing the return on the State's investment. Key

recommendations were made to improve our effectiveness and efficiency as well as productivity. In FY09, in response to the external review report, the senior management wrote a draft management plan to address the recommendations. Many of the recommendations focused on more integration of UMBI's science and collaboration across the four research centers.

The most exciting opportunities in biotechnology are found at the interfaces between specialized disciplines. This is exemplified by several of our current research programs such as the program that combine physics with biology in developing ultra-rapid, ultra-sensitive diagnostics for biomedical and biodefense applications and the program that finds ways to generate electrical signals from biological events in nanoscale devices using materials such as chitosan that are derived from the shells of crabs or shrimp that would otherwise be wasted.

UMBI Inter-Center Research Grant Program

UMBI continues to fund the Inter-Center Grant program to promote internal research collaborations, move commercially viable technology forward, and assist the overall research efforts. To date UMBI has committed \$800K to the internal grant program funding several projects involving collaborations between UMBI's research centers such as:

- COMB and MBC faculty working together have developed a system to control expression of genes within individual living cells—technology with broad applications in biomedical research
- CARB and CBR faculty working together are investigating the role of specific genetic sequences in mosquito invasion and transmission of malaria creating opportunities to control the disease
- COMB and CARB faculty working together are producing modified antibodies derived from the ancient immune system of sea lampreys; these high-affinity antibodies have numerous diagnostic applications
- COMB and MBC faculty working together using a zebrafish model system have developed a vertebrate-based, cost-effective platform for screening drugs designed to treat neurodegenerative diseases.

Integration and collaboration, both within UMBI and with other organizations, is also in tune with a general shift in federal research dollars towards larger, collaborative consortia. Our commitment to integration and collaboration is underscored by the fact that our non-State revenues for FY2008 were drawn from nearly 60 different sources. Partnering and collaboration are important themes in our missions of research, commercialization, workforce training, and education.

We are now concentrating on areas of cross-center strength and capabilities that create further synergies—a new operating mode that is more parallel with our industry mission of economic and workforce development.

Moving to Strengthen and Leverage our Resources: Signature Areas

To achieve better internal integration of our research programs, we have identified four Signature Areas—areas of special strength at UMBI that have been targeted for future investment—to encourage excellence in science. These signature areas each involve research activities at one or more of UMBI's centers. Signature Areas include:

- Bio-Inspired Nano-Assembly
- Biomedical and Biosystem Engineering
- Molecular Biophysical Dynamics
- Sustainable Marine Systems

One of the great strengths of UMBI—that ties in to our Signature Areas—is our potential for collaborations and partnerships. We have developed signatory areas that help stimulate a more integrated, collaborative approach that bridges the specialized disciplines represented by our four research centers.

UMBI is known worldwide for its partnering and collaborations. We believe that UMBI serves as the biotech 'glue' in collaborations with industry, government and other institutions.

UMBI Proof of Concept Grants

UMBI has funded several Proof of Concept grants, totaling \$130,000, which are designed to further advance UMBI technology and make it commercially viable and include:

- A method for assessing the concentration of oxygen in the brain to determine the progression of disease, such as stroke, and to determine the effectiveness of drug treatment
- A new assay for prostate cancer provides a sensitive and specific novel approach for the early diagnosis and prognosis of prostate cancer
- An ultra-rapid, ultra-sensitive method for determining the presence and concentration of anthrax spores with applications in detection of other biological agents as well
- A powerful substance in marine microbes that is effective against a variety of pathogenic bacteria including the extremely dangerous community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA)

IN FY08 UMBI hired three new faculty members to expand our expertise in cutting-edge areas of biotechnology such as addressing drug resistance of antibiotic resistant bacteria by using enzymes from naturally-occurring bacterial viruses, finding new ways to target drugs to specific targets within the body, such as tumors, and studying the structure and interactions of immunological control systems such as interleukin-7.

Investment in UMBI Leverages Non-State Resources

UMBI faculty are funded by non-state grant and contract awards. Examples shown below show only one year of the funding of multi million dollar projects that are non-state FY08 awards over \$300,000:

- \$3.6 million from the NOAA Chesapeake Bay Office for blue crab research: basic biology, hatchery technologies and the potential for replenishing stocks
- \$2 million from the National Science Foundation (NSF) for devices to detect and mediate bacterial cell-cell communication
- \$1.2M from the National Institute of Standards and Technology (NIST) for operations and management of various NIST-related UMBI projects
- \$585,000 from the Department of Energy (DOE) for annotation of novel enzymatic functions in bacterial methanogens
- \$575,000 from the University of California at Berkeley for bioprospecting for high-temperature conversion of lignocellulose to ethanol
- \$574,000 from the National Institutes of Health (NIH) for studies of structure, function, and inhibitors of drug targets of the pathogen *Giardia*
- \$525,000 from NIH for studies of structure and function based on genomic sequences
- \$418,000 from NIH for research on genetic elements in mosquitoes that can be used to fight malaria
- \$405,000 from NIH for studies of self and non-self recognition by autoimmune and tumor-specific T cell receptors
- \$400,000 from the U.S. Army for bioinspired signal recognition and transduction
- \$354,000 from Columbia University for studies of the molecular basis of sudden cardiac death
- \$350,000 from NIH for detectors known as caged probes, for studying cellular physiology
- \$345,000 from Bio-Rad Laboratories for ultra-rapid, ultra-sensitive metal enhanced fluorescence detectors
- \$337,000 from NIH for studying mechanisms of antiviral innate immunity
- \$316,000 from NIH for studying the molecular biology of hypoviruses
- \$307,000 from NIH for functional studies of ubiquitin which may play a significant role in Alzheimer's disease

Education and Workforce Training

This year we have expanded our educational outreach programs and have brought Dr. Candice Rettie on board as the new Vice President of Education, Professional Advancement and Training (EPAT) with Dr. Mary Stapleton as Director. We understand how early, hands-on experiences can capture the imagination of young people and inspire the students of today to become the scientists of tomorrow.

In some cases, we bring the students to the science. The SciTech program has, since its inception, brought over 25,000 Maryland middle school and high school students to UMBI's Columbus Center in the Inner Harbor to perform real hands-on experiments in our laboratories.

In other cases, we bring the science to the students: our Maryland Loaner Lab program offers comprehensive biotechnology curriculum and lab activities available in self-contained FedEx packages which include all of the reagents, equipment, background information and protocols for students to conduct inquiry-based science activities in the classroom. The Loaner Lab has served over 16,000 students in 20 of Maryland's 24 school districts since 2004.

We have also developed a new 'reverse field trip' program where staff members from EPAT go out to the classrooms and deliver biotech labs.

This past year, we have revamped all of the SciTech labs with a focus on biotechnology that remains consistent with the Maryland State Department of Education voluntary science curriculum. We have renovated our lab facilities, created new laboratory experiences, and hired new staff trained as Science, Technology, Engineering and Mathematics (STEM) educators, as well as in industrial applications and biotechnology.

This year, EPAT placed 15 student interns in positions at our four centers to conduct state-of-the-art research mentored by professionals.

In addition, fifteen summer internships in Marine Biotechnology were provided at UMBI-COMB through our participation in the Living Marine Resources Cooperative Science Center (LMRCSC). Interns included students from Towson University, Morgan State University, Eckerd College, Virginia Commonwealth University, Hampton University and the University of Maryland Eastern Shore. The students worked in UMBI-COMB labs for 10 weeks. In many cases they performed research that addressed critical environmental issues in the Chesapeake Bay and then, produced oral presentations and poster sessions.

The continued importance of the LMRCSC program is illustrated by a superb student, Jeanette Davis, who recently graduated from Hampton University and first came to UMBI as an LMRCSC summer intern. After a productive summer internship, Ms. Davis decided to pursue doctoral research at UMBI-COMB and

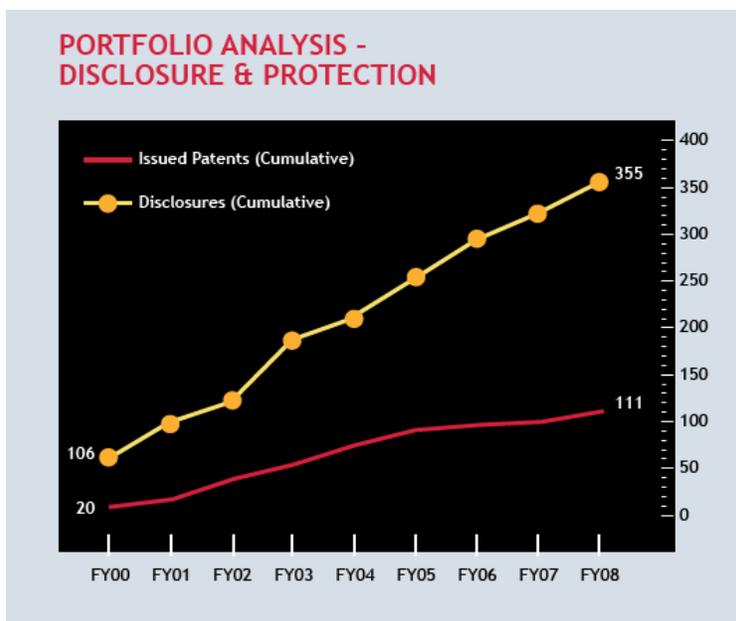
was recruited with LMRCSC funding. Subsequent to her arrival, Ms. Davis was honored with a prestigious NSF "Bridge to the Doctorate" fellowship to work with one of our faculty members who is an expert in deriving pharmaceuticals from marine organisms.

We are especially proud that the 2008-09 academic year will mark the graduation of our first two Ph.D.s trained under LMRCSC - Jose Reyes and Naomi Montalvo.

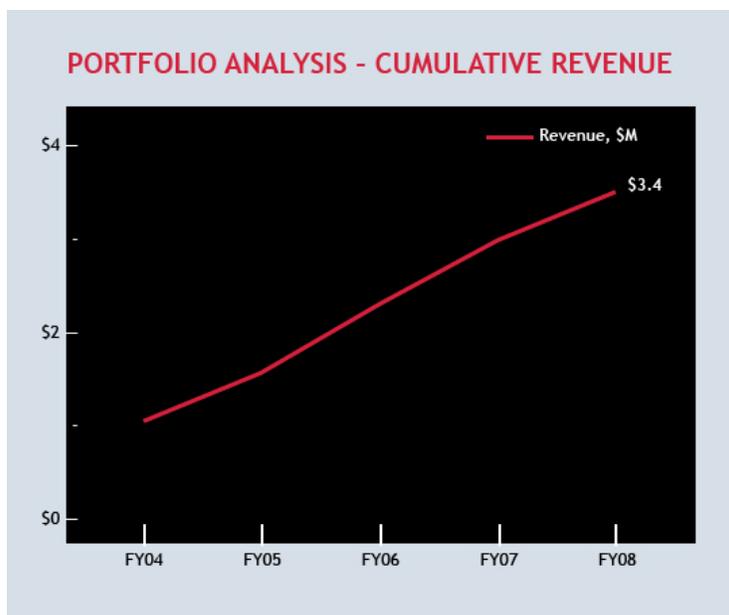
Economic Development

As the only Maryland research institution focused entirely on biotechnology, we take our responsibilities to the State very seriously. Of the 29 industry awards UMBI received that were active in FY08, 16 or 55% were from Maryland companies such as MedImmune, Rexahn, Potomac Affinity Proteins, Calibrant, and Adlyfe. In addition, nearly 1/3 of all UMBI active licenses at the end of FY08 (19 of 56) were with Maryland companies.

In 2008, UMBI scientists were issued 10 patents, from UMBI owned technologies. This increased our portfolio to 111 cumulative patents. We also had six patents issued in the first quarter of FY09. Disclosures, the first step in assessing intellectual property for licenses or co-development, continued a multi-year pattern of positive growth.



UMBI regularly partners with industry to bring new products to market; improve existing products, diagnostics, and procedures; co-develop technology; and indeed to serve R&D needs for some, mostly small, biotech and life sciences companies. In FY08, UMBI has again recognized a dramatic increase in the reimbursement of patent costs by industry partners.



Conclusion

We are moving forward in a sea of rapid change within the new integrated biosciences. Biotechnology is moving at a fast pace and the challenge for UMBI is to be part of the change now and flexible enough to keep ahead of the pace. Our partnerships, such as that with NIST, is both critical and strategic as we learn how important it is for all fields within biotechnology to better understand protein function, protein to protein interaction and the measurement of protein regulation, expression and interaction in real time. The External Review Recommendations focused on what UMBI needed to change in order to transform our research efforts to meet future challenges today. The Senior Executive Management at UMBI took the recommendations very seriously and feels that with some changes in operations and functions, UMBI would be well positioned to continue to lead biotechnology at the forefront to meet societal needs. Your support and advocacy for our role in the State and USM is greatly appreciated.

UMBI's Comments as Requested by the Legislative Analyst

Question Number One

The President should comment on the current status of BCARC, specifically what initiatives are being undertaken to secure additional funding, the overall outlook for the consortium, and how the findings can support efforts to replenish the blue crab population in the Chesapeake Bay.

In terms of the current status of BCARC, the last cycle of the Federal money (FY07) ended November 31, 2008, and we are now operating with a no-cost

extension. With no new money, the program will close sometime this fall and the Consortium will be dissolved.

What else are we doing to secure additional funding? What we always do in such situations, namely submitting proposals to NSF, NOAA, Sea Grant, USDA, Saltonstall-Kennedy and other sources. Please note however, that such grant awards are not at the level of funding that will allow BCARC to continue the activity of the Consortium or continue large-scale integrated research to support the blue crab fishery in the Chesapeake.

How can our findings support efforts to replenish the crab population in the Chesapeake Bay? On many fronts since DNR has already made use of BCARC research findings for their current management efforts. First, the more complete understanding of the biology and ecology that we have provided will lead (and has already led) to more science-based management of the fishery. The best example would be developing the 'protected corridor concept' to fully protect the females as they migrate down to the spawning grounds. Obviously, we believe that through the hatchery-based replenishment of the spawning stock and scale up to the intermediate phase of releasing a million juveniles, we would start to have an impact on the spawning stock and in turn on the blue crab fishery.

It is our plan to continue the work at the Piney Point Hatchery until May of 2009 and then, shut down the operation. We are in discussion with Virginia to see if they want to find a hatchery in Virginia to continue the scale up research which was planned to go out to 2012. The economic assessment of the BCARC program by DNR resulted in a report with recommendations not to fund the scale up project for the next three years due to the total cost of close to \$9 M dollars. It was the cost that they felt was prohibitory, not the science or approach that BCARC has been utilizing.

Question Number Two

The President should comment on actions being taken in response to the findings and recommendations of the external review.

Our initial response to the external review focused on improving six areas at UMBI. These areas included:

Structure & Finance: This topic was addressed in relation to a recommendation to improve integration with programmatic, fiscal and physical parameters in mind. Both senior management and faculty agreed that integration should be accomplished at the programmatic level. Faculty, however, expressed concern that this should not be accomplished by sacrificing the center oriented management structure that has been in place at UMBI. To foster programmatic integration there was consensus that this could be approached by better aligning resources to meet strategic goals.

A draft “UMBI Reorganization & Management Plan” was developed to address this recommendation.

Science: The report underscored the need to consider the scale of the institution and recognize a need to encourage more critical mass for scientific research in each center, specifically, in relation to better defining and developing “signature areas” of research excellence for UMBI, and to foster collaboration both internally between centers and externally within and outside of the USM.

A key recommendation of the review team was that UMBI should create and utilize a properly constituted Scientific Advisory Board to assist with this effort. The Senior Management Team and faculty agreed this action item was something that should be implemented as a priority.

The UMBI Research Council was tasked with recommending related strategic hires and nominees to serve on the External Scientific Advisory Board. They have submitted names for review by the President. The President has also contacted the National Academy of Sciences for additional names.

Translation: The report recommendations relative to this topic focused on a need to more successfully bridge science to translation in keeping with the stated mission of UMBI. The Review Team suggested that the definition of translation as it applies to UMBI activities needed to be better clarified and that efforts to make the translational process easier for researchers be improved. As a result UMBI management decided to:

- Further clarify the “translational” definition and process considering the percentage of expenditures versus percentage of award in the equation.
- Determine how frequent to make this evaluation and how UMBI will verify the perspective arrived at in the evaluation process.
- Consider how this evaluation factors into Promotion & Tenure, identify potential barriers to successful implementation, suggest ways to remove those barriers, improve the process, and set new related goals.

Communication: The Review Team report called for efforts to improve internal and external communication and insure that the UMBI mission is understood by all stakeholders in the organization. There was broad support for this recommendation within UMBI and determination that it should be implemented internally from center to center, center to central, and from central to center so as to foster greater transparency in decision making, and to better promote the unique strengths and capabilities of the institution.

A team, led by the president’s office, was appointed to develop and implement strategies to insure that the UMBI mission and the institutional priorities are understood by all and the scope of the organizational structure and financial resources that will be employed to achieve that mission.

A daily UMBI wide RSS newsfeed was implemented this year as part of efforts to address this recommendation.

Student Support: The Review Team made a number of recommendations about UMBI improving the situation for graduate students at the institution. With few exceptions, all stakeholders at UMBI agreed that UMBI could benefit by providing increased support for graduate education. There is broad endorsement for the idea of holding student symposia, career advising, and various networking opportunities.

The Review Team suggestion of including graduate student participation in future UMBI retreats, and the idea of offering internal graduate fellowships are positively received and seen as ways to foster integration.

Post-doc and graduate student participation in shared governance activities has increased dramatically. An informal networking process for both groups has been established. In addition, UMBI held a graduate student retreat this past fall, and it was well received.

Metrics: Several recommendations of the Review Team revolved around the need for UMBI to develop and implement key metrics for performance measure and to improve accountability. They suggested that the institution and the Centers identify peers to measure success comparatively to those competitors.

In response, senior management agreed that chosen external metrics should be aligned with those related to our internal performance measures. New metrics with benchmarks identified might be indicative of how good UMBI is at attracting funding for research, how good UMBI is at collaborating with other USM institutions to advance research, and how well UMBI stimulates the advancement of biotechnology with non-state funding among other measures. Any new Managing for Results or Dashboard Indicators will be reflective of UMBI without IHV. UMBI is in communication with the USM Office to identify such indicators.

Several of these reporting metrics are already tracked and discussions about adding new ones are underway. Some comparative institutions have been identified and contacted about sharing related data. UMBI is also working to modify the MFRs used for reporting to the legislature to more accurately reflect progress on mission related achievements.

The UMBI senior management wrote a draft proposed management plan to address all the findings and recommendations of the external review. The draft plan addressed areas of duplication and recommended centralizing some of the centers' administrative responsibilities. This draft plan was supported by the UMBI Board of Visitors, the Chancellor of USM, and the UMBI Executive Senior staff; however, the plan was not supported by the four UMBI Center Directors, the faculty, or the graduate students currently working at UMBI. The draft plan, which would unified UMBI via the signatory programs and put the financial

decisions of investing in future research in the hands of a proposed Chief Science Officer and the President with input and recommendations from the Research Council, has been tabled for 120 days pending the Regent's review of UMBI.