AAAS Review of the Rhode Island National Science Foundation Experimental Program to Stimulate Competitive Research

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Executive Summary

The driving vision of the Rhode Island Experimental Program to Stimulate Competitive Research (Rhode Island EPSCoR) is to be an international leader in understanding and predicting the response of marine organisms and marine ecosystems to climate variability. The program aims to provide a platform for collaboration and cooperation among the nine institutions of higher education in Rhode Island and to enable alignment of efforts with state needs in order increase research competitiveness in marine life sciences.

A five year, $20 million cooperative agreement with the National Science Foundation (NSF) supports a portfolio of activities designed to enable research and education activities, thereby enhancing the research competitiveness of Rhode Island. These activities include: investment and operational support of core facilities (marine life science, genomics, and proteomics facilities); investments to improve and integrate research at undergraduate institutions; and the facilitation of partnerships in design, data visualization, and communication in interdisciplinary projects.

The plans for infrastructure investments are sound and align with the overarching vision of the program. The research questions to understand marine organisms in response to climate change are appropriate and a strength, given Rhode Island’s long history of contributions to marine biology. Rhode Island EPSCoR consists of an impressive and diverse group of institutions and it is fully expected that the network will continue to strengthen and serve as a means for generating more collaborative outcomes during the next four years. Since the inception of the Rhode Island EPSCoR, the leadership and participants have emphasized that the small size of the state is an asset. This geographical closeness of the partner institutions was described as a key to scientific cooperation, collaboration and sharing of resources that would not be possible in larger states.

A summary of program areas, assets, and opportunities for growth in order to achieve the next level of competitiveness for Rhode Island EPSCoR is provided here:

- **Program Leadership and Communication**: It is clear that the program leaders are committed to strengthening the Rhode Island EPSCoR with a statewide focus and their efforts toward communication and collaboration are commendable. Given the challenges of managing a diverse set of tasks over many institutions with varying goals, missions and cultures, the AAAS review panel notes that communication with the partner institutes, especially at the leadership level, will need to remain prominent and is required for further statewide capacity building in research. Areas of attention include engaging representatives from the undergraduate institutions as a formal partner in the leadership team and hiring of the Rhode Island EPSCoR Academy Director.
**Core Facilities:** A major portion of the Rhode Island EPSCoR investment includes acquisition of equipment, renovation of lab facilities, and the operation and management of the three core facilities. These facilities provide faculty and students in Rhode Island with access to state-of-the-art equipment and services for studying marine organisms and offers the potential for a streamlined work flow for the isolation of organisms and their analyses at the molecular level. After four years of investment from prior NSF EPSCoR funding, these core facilities are fully functional and are of excellent quality. Business models for the genomics and proteomics facilities are now in place and provide a reasonable way to recover costs for day to day operations. The AAAS review panel now recommends planning for the next phase of core facility development and growth. For the Marine Life Science Facility, this will involve analyzing the costs for maintenance, repair, and sustainability, and developing an appropriate plan. For the proteomics and genomics core, the capacity and use of the facilities should be tracked and coupled to research outcomes. The Rhode Island EPSCoR leadership should consider working with institutional leadership to establish policies and mechanisms that would allow the core facilities to respond to equipment and staffing needs in a rapid manner or allow the budgeting for equipment needs in an annual budget.

**Undergraduate Institutions:** The undergraduate institutions provide an important role in education, research and workforce development. They have emerged as fuller partners and now have stronger ties to the research institutions in the state, which didn’t exist prior to the Rhode Island EPSCoR. The AAAS review panel is pleased to see that representatives from the undergraduate institutions are team leaders in all three research questions of Strategic Goal 1 (to engage in collaborative competitive research in marine life science). This is a positive sign that research at undergraduate institutions is valued and they have much to gain through these collaborations. It is important that Rhode Island EPSCoR includes representatives of undergraduate institutions at all levels of the organization, including the Steering Committee and as a co-Principal Investigator, and for their contributions to Rhode Island statewide research enhancement be captured (see comments on Evaluation).

**Design, Data Visualization, and Collaboration:** A research partnership with a design school is not only unique to the Rhode Island EPSCoR, but also unique for any scientific research program. The role of the Rhode Island School of Design is more clearly articulated than in previous AAAS site visits and indeed has tremendous potential. While the research goals of RISD are strategically sound, their participation should be further integrated in all aspects and stages to the Rhode Island EPSCoR so that RISD can benefit from the scientific expertise of the partner institutions.

**Evaluation:** Given the catalytic intent of NSF EPSCoR funding, it will be important for Rhode Island EPSCoR to demonstrate how the current five-year investment ($20 million) has elevated the competitiveness of the state compared to where it sits today. The AAAS review panel recommends that Rhode Island
EPSCoR establish clarity on connecting the scientific, education, and partnership goals by articulating specific indicators of success for the program, while leaving room for unconstrained outcomes that are naturally associated with discovery research.
# Table of Contents

Executive Summary ............................................................................................................ 2  
Table of Contents .............................................................................................................. 5 
I. Introduction ................................................................................................................... 6  
II. Background Information on Rhode Island EPSCoR Institutions ......................... 8  
III. Assessment of Progress, Goals, and Implementation .............................................. 11  
    Overarching Themes: .................................................................................................. 11  
    A. Leadership and Management .......................................................................... 11  
    B. Strategic Plan and Evaluation ......................................................................... 13  
    C. Integration ........................................................................................................ 15  
Marine Biosciences Research: Attaining National Recognition .................................. 17  
Core Facilities to Support Research Competitiveness and Education ....................... 17  
    A. Marine Life Science Facility ........................................................................... 18  
    B. Proteomics Facility ......................................................................................... 19  
    C. Genomics and Sequencing Center ................................................................... 20  
Cyberinfrastructure to Foster Collaboration Across Rhode Island ................................ 23  
Design, Data Visualization, Communication, and Interdisciplinary Collaborations ... 24  
Building and Strengthening Research at All Rhode Island Undergraduate Institutions 27  
Appendix A ...................................................................................................................... 29  
Appendix B ...................................................................................................................... 33
I. Introduction

This report includes findings and recommendations by a review panel convened by the American Association for the Advancement of Science (AAAS). The AAAS Research Competitiveness Program was requested by the Rhode Island Experimental Program to Stimulate Competitive Research (Rhode Island EPSCoR) to conduct a review of its efforts in their Research Infrastructure Improvement (RII-Track I) award. The RII award is a five-year cooperative agreement (2010 – 2015) for $20 million with the National Science Foundation (NSF). This is the first of a series of annual reports that will be prepared by the AAAS external review panel on the implementation of the RII award.

The Rhode Island EPSCoR is a partnership among nine academic institutions, state economic development agencies, and secondary schools to strengthen life sciences research particularly in marine biosciences. Nine academic institutions\(^1\) comprise the Rhode Island EPSCoR, wherein the University of Rhode Island serves as the lead institution and fiscal administrator of the award. The partner institutions are briefly described in the next section of the report.

According to its strategic plan, the Rhode Island EPSCoR has two broad-reaching goals: 1) advance Rhode Island’s competitiveness in marine life science by integrating key assets in genomics, proteomics, metabolomics, cyberinfrastructure, and visualization; and 2) integrate life science research training and education by building collaborations across the state at the pre-college and higher education levels. To address these goals, new investments in research and education infrastructure are being made throughout the state at each of the partner institutions. These efforts seek to build and strengthen the infrastructure that was established with earlier NSF EPSCOR support\(^2\).

The purpose of the AAAS review panel is to 1) describe and document Rhode Island EPSCoR activities, processes, and participation for both improvement and accountability purposes; 2) assess the merit and value added of specific programmatic components and elements, including how effectively the programs are meeting institutional and state needs; and 3) analyze process, output, and outcome goal attainment. As a year 1 review, the AAAS panel’s report will also provide a benchmark for future evaluation reports.

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\(^1\) The participating institutions in Rhode Island EPSCoR include Brown University, Rhode Island School of Design, University of Rhode Island, Bryant University, Providence College, Rhode Island College, Roger Williams University, Salve Regina University, and the Community College of Rhode Island.

\(^2\) The Rhode Island EPSCoR began in 2006 with a three-year RII award from the NSF followed by one year of bridge funding from 2009 – 2010. During this time, the program established partnerships with nine institutions of higher education and invested in three core facilities to support marine life sciences: Center for Marine Life Sciences, Genomics and Sequencing Center, and proteomics. The program also established and supported research, education, and workforce efforts at the primarily undergraduate institutions. These efforts were designed to support the Rhode Island EPSCoR mission to attain national prominence and competitive research excellence in the marine and life sciences and to develop and support the synergistic integration of research, education, innovation and communication among its partner institutions. AAAS conducted a yearly review of those activities and provided final reports to the Rhode Island EPSCoR leadership.
To address these issues, a senior review panel was recruited having expertise in management of large-scale research programs and core facilities operations, research integration at primarily undergraduate institutions, art/design and science research collaborations, as well as technical expertise in the following areas: marine biosciences, computational biology and bioinformatics. The panel was led by an AAAS staff director experienced in program evaluation. Background materials\(^3\) were provided prior to the site visit and over the course of 2 ½ days, the panel interviewed state and academic stakeholders and visited core facilities (the full agenda is provided in Appendix A). The panel then debriefed the Project Director and Associate Project Director with its initial findings.

This report expands on the panel’s initial observations that are based on interviews and documents provided during the site visit, describes the state of the program today and the directions planned for growth, and provides recommendations on guiding the program for optimal success. The report begins with a brief overview of the nine partner institutions illustrating the diversity, strengths, and complexity of a network this size. Next, we discuss several overarching themes critical to the program’s success and sustainability. Finally, a detailed assessment of the program components and plans for the future is provided.

\(^3\) Background materials provided to the panel include the RII research proposal, the RII strategic plan, and the goals and vision for the program.
II. Background Information on Rhode Island EPSCoR Institutions

The Rhode Island EPSCoR is comprised of nine colleges and universities representing a diverse range of institutions with respect to mission, student enrollment, concentration and expertise, and research capacity. Each institution brings unique assets to the Rhode Island EPSCoR network as summarized below:

**Brown University** (Brown) is a private Ivy League institution with both undergraduate and graduate programs. Brown has strong assets in research and teaching and has resources aligned with Rhode Island EPSCoR that include staff expertise in bioinformatics and computing and a state-of-the-art proteomics core and genomics center. Brown investigators are the primary users of the proteomics core and their continued acquisition of major equipment has been vital to the success of the center. Moreover, Brown’s role in enhancing Rhode Island’s cyberinfrastructure and capacity in computational biology provides value added to the current RII award. Finally, Brown has been an active partner in hosting summer research experiences for undergraduates (REUs) from other Rhode Island EPSCoR institutions.

**Bryant University** (Bryant), a private institution, has an undergraduate College of Arts and Sciences and an undergraduate and graduate College of Business. Bryant has 17 scientific faculty members in two departments: science & technology and mathematics. Bryant has a long tradition in business and management education, and has recently added a new program in Science and Technology. Initial Rhode Island EPSCoR funding provided analytical equipment to Bryant and in the next few years, Rhode Island EPSCoR will provide funding for an inductively coupled plasma mass spectrometer, an environmental scanning electron microscope, summer faculty salaries (2/yr), and faculty course releases (1/yr) as Bryant continues to develop its educational programs.

**The Community College of Rhode Island** (CCRI) is the state’s only public, comprehensive, associate degree-granting institution, and with the Rhode Island EPSCoR, CCRI has provided opportunities for many Rhode Island pre-college students to learn about opportunities in science and technology. Specifically, the Biotechnology Program and Outreach Center provides equipment and “hands-on” experiences in biotechnology and marine sciences to elementary, middle, and high school students, teachers, and schools. This close alliance between CCRI and Rhode Island public schools is a key element of the workforce development and educational efforts of Rhode Island EPSCoR.

**Providence College** (PC), which offers both undergraduate and master’s degrees, is a Catholic liberal arts college. This institution has 37 faculty in the biology, chemistry/biochemistry, and math/computer science departments and offers majors in all of these areas. PC is an established undergraduate research institution with excellent

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4 The genomics center at Brown is separate from the NSF EPSCoR-subsidized Genomics & Sequencing Center at URI.
facilities and actively promotes undergraduate research. PC has received Rhode Island EPSCoR funding for digital imaging equipment and a genetic analyzer, and in the next five years will receive funding for more research equipment (including growth chambers, a flow tracker, probes, thermocyclers, and photosynthesis equipment and camera) as well as support for summer faculty salaries (4/yr). One PC faculty member participates as a lead in Rhode Island EPSCoR cross-institutional research focused on the structure and function of coastal marine food webs and biogeochemical cycling.

**Rhode Island College (RIC)** is an emerging undergraduate institution with 54 faculty in the biology, physical science, and math departments and offers majors in biology, radiologic technology, chemistry, physics, computer science, and math. RIC is building its research infrastructure with the recent acquisition of an Olympus FluoView 1000 confocal laser scanning microscope; past Rhode Island EPSCoR-funded equipment includes a gradient thermocycler, nanodrop spectophotometer, and microscopes. Future Rhode Island EPSCoR funding will provide additional research equipment (microplate reader, microscope, sea water tanks, a nanodrop, and photosynthesis system) and summer faculty salaries (3/yr) to support more research-active faculty members. One faculty member is a team leader in Rhode Island EPSCoR cross-institutional research focused on the stress responses of marine organisms in response to climate change.

**Rhode Island School of Design (RISD)** is a leading art and design institution and is a new research partner in the Rhode Island EPSCoR. RISD has been promoting its “STEM to STEAM” philosophy (integration of arts education into science, technology, engineering, and math curricula) by initiating a dialog on a national level and by strengthening its foundation in the sciences at its own institution. Through its Rhode Island EPSCoR partnerships, RISD seeks to build connections between science and art/design in the areas of science visualization, science communication, STEM education, and interdisciplinary problem solving.

**Roger Williams University (RWU)**, a liberal arts college with undergraduate, graduate, and professional students, has 30 faculty members in the departments of biology/marine biology, chemistry/physics, math, and environmental studies. RWU’s unique undergraduate program in marine biology offers both educational and research opportunities. RWU serves as an important link between Rhode Island undergraduates and the research goals of Rhode Island EPSCoR in two ways. First, it administers the successful summer undergraduate research fellowship (SURF) program; second, faculty members are engaged as Rhode Island EPSCoR team leaders in research on global climate change and the effects on the ecology of marine pathogens and parasites.

**Salve Regina University (Salve)**, a private, Catholic, liberal arts institution with both undergraduate and graduate programs, has 13 faculty in the departments of biology, chemistry, and math and offers majors in each of these subject areas. Salve is a developing undergraduate research institution and has been supported by Rhode Island EPSCoR with funding for freezers, incubators, microscopes and summer faculty salaries (5/yr).
The University of Rhode Island (URI) is the state’s land and sea grant university. URI receives approximately $75 million in federally funded research support and is home to the Graduate School of Oceanography (GSO). URI is the fiscal and administrative lead of the Rhode Island EPSCoR, serving as the cornerstone for holding the partnerships together and provides overall program leadership. URI houses the Marine Life Science Facility at GSO and the Genomics and Sequencing Center at its Kingston campus. Both facilities are supported by NSF EPSCoR and are managed by staff that provide service to all faculty and students in Rhode Island EPSCoR. Faculty members at GSO also serve as team leads in several of the research aims of the Rhode Island EPSCoR.

The AAAS review panel is impressed with this group of institutions and their efforts toward communication and collaboration, and fully expects that these ties will be strengthened to produce more collaborative outcomes during the next four years.
III. Assessment of Progress, Goals, and Implementation

Overarching Themes:

A. Leadership and Management

The Rhode Island EPSCOR is about to complete the first year of its five year cooperative agreement from the NSF, which follows a prior four-year award to purchase equipment for its three core facilities in marine life sciences, genomics and proteomics. It is an appropriate time to review the leadership and management of the program in order to implement adjustments which will strengthen the program for the duration of the cooperative agreement with NSF and beyond.

The leadership team and project management structure are described on pages 17-20 of the Rhode Island EPSCoR strategic plan. It is clear to the AAAS review panel that the leadership group is comprised of very dedicated, hard-working individuals committed to success. The PI and Project Director is Dr. Peter Alfonso, who is also the Vice President for Research and Economic Development at the University of Rhode Island. The day-to-day management of the program is led by the Associate Director, Dr. Jennifer Specker. Dr. Specker is a full professor and marine biologist at GSO and is well-matched to the scientific agenda of Rhode Island EPSCoR. It is commendable that both Drs. Alfonso and Specker are committed to strengthening the program with a statewide focus. The AAAS review panel notes that communication with the partner institutes, especially at the leadership level, will need to remain prominent, and is required further statewide capacity building in research.

Managing this diverse set of tasks for the program over many institutions with varying goals, missions and cultures is no easy task, especially in these difficult economic times. However, the progress is very impressive and the recommendations made in this report are intended to strengthen the teams’ capabilities and increase efficiencies to provide for a higher percentage of success of the program.

A strong coordinated leadership and management team are critical for success. Clear lines of responsibility, authority and accountability are essential. This is especially important given that everyone involved has other responsibilities at their home institutions including spending large amounts of time budgeting and re-budgeting their areas of responsibilities due to the difficult state budget situation in Rhode Island. Given the responsibility of managing a statewide research program, the AAAS review panel recommends that one of the two senior personnel on the team commit closer to a full-time effort on this program. We believe that given the complexity of issues and federal and economic budget difficulties faced, it is crucial to have one senior leader of the management team devote more time and effort. The management team has also had considerable turnover since the beginning of the first Rhode Island EPSCoR RII award in 2006. With team members who are new to management of large research programs, the AAAS review panel encourages senior leadership to learn new skills in management and
leadership through professional development executive training courses and workshops. Not only will the participants benefit, but they will return to the program as potential mentors to current and new junior staff and other team members of the program.

We also suggest some clarification of the titles to better reflect responsibilities outlined in the Roles of Management Teams and Roles of Project Staff (pages 17 and 19 in the strategic plan). First, change the Principle Investigator and Project Director title to Principle Investigator and Program Director; second change the Associate Project Director title to Project Director. By doing so, the roles of these two individuals will be clarified and confusion will be reduced as to their individual responsibilities. The latter of these suggestions is especially important since an Associate Project Director title does not reflect the current responsibilities of this position.

In order to further clarify titles with responsibilities commensurate with decision making authority and accountability, the AAAS review panel recommends clarifying the descriptions for each of the positions listed on pages 17 and 19. Descriptions for these positions should include a list of responsibilities and to whom this person reports to. Further suggestions on management structure are provided below.

A question was raised whether an investigator from an undergraduate institution should be included as a co-PI of the Rhode Island EPSCoR. The AAAS review panel supports this idea and envisions three positive outcomes. First, the lines of communication among the research partners (Brown/URI/RISD) and undergraduate institutions should become more open and clear. Second, if open lines of communication are established, the undergraduate institutions could learn more about the availability and suitability of equipment within the cores, thereby leading to more use of the cores. Third, the elevated profile will empower undergraduate institutions to contribute more to the assessment of Rhode Island EPSCoR, as integrating this data in the program outcomes should have positive impact on future Rhode Island EPSCoR funding.

The AAAS review panel understands that there are ongoing discussions about merging the responsibilities of the Education, Outreach and Diversity position with those of the Academy Director, which would eliminate the Education, Outreach and Diversity position. The AAAS review panel agrees with this assessment; however that change would result in adjustments in the requirements for the open Academy Director position. Finding the right person for this position is key and, unfortunately, the Academy Director has had a history of turnover. Efforts should be focused on writing a new position description to cover the new education, outreach and diversity responsibilities that the

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5 Organizational charts can play an important role in elucidating the flow of work for management. The AAAS review panel believes that it would be helpful if the organizational charts for the Project Staff and the Management Teams were further detailed by constructing two charts for each current chart: one organization chart that refers to the reporting structure and another that considers function. The classic organization chart often refers to who reports to whom. However, a function organization chart can be very helpful in understanding who is responsible for what.

The Organizational Chart for Project Staff on page 20 lists the project management team. It shows two open senior management positions and one open assistant position. The AAAS panel strongly recommends that filling the two senior management positions be a high priority especially considering that there are only four positions at this level of management.
Academy Director will inherit. The AAAS review panel’s understanding is that the Academy Director will have responsibilities including but not limited to managing outreach and diversity requirements as well as overseeing the biotechnology and STEM outreach coordinator. Given the range of these responsibilities, the Academy Director will require assistance from a new full-time senior staff person.

B. Strategic Plan and Evaluation

During the fall of 2010, the Rhode Island EPSCoR engaged in a strategic planning exercise. This meeting brought together over thirty stakeholders for a discussion about the vision and projected milestones for the five-year award. These discussions were captured in a strategic planning document, called Strategic Plan 2010-2015, and was shared with the AAAS review panel.

Using the improvements in research infrastructure purchased and the opportunity to increase intellectual capital provided through the Rhode Island EPSCoR, the strategic plan consists of six goals, three each concerning intellectual merit and three that promote broader impacts (Appendix B).

The overarching research questions for the strategic plan are: What are the stress responses and evolutionary potentials of marine organisms in response to climate change? How are the structure and function of coastal marine food webs and biogeochemical cycling being redirected in response to climate change? How will climate change affect the ecology of marine pathogens and parasites?

The AAAS review panel believes that the scientific research questions are good and provide a foundation for the infrastructure, education, and outreach components of the strategic plan. They are very appropriate given Rhode Island’s long history of contributions to marine biology. The vision of Rhode Island becoming an international leader in addressing the questions noted above is an admirable goal. The mission of using the new infrastructure as the platform to promote collaboration and cooperation among Rhode Island’s institutions of higher education is a strength. The vision, mission, and values section of the Rhode Island EPSCoR strategic plan are aligned well with the state's Science and Technology Plan and are complementary to each other.

The first goal of advancing Rhode Island's competitiveness in marine science will be accomplished by acquiring equipment to enable studies on the genomics, proteomics, and metabolomics of marine organisms and integrating these facilities through an expanded cyberinfrastructure and with a Center for Computation and Visualization. The centers for Marine Life Sciences, Genomics and Sequencing, and Proteomics were created to achieve this goal. Three objectives for this first goal include engaging in collaborative, competitive research; enhancing core infrastructure and expanding user base; and building cyberinfrastructure and capacity in computational biology. A significant amount
of equipment has been purchased and the centers are up and running. Specific recommendations on the centers can be found later in this report.

The second goal is to build a foundation for collaboration among educators and researchers in the state, and to integrate life science research training horizontally across institutions of higher education and vertically with pre-college teachers and students. This goal is to be accomplished through the Rhode Island EPSCoR Academy, which was created in 2006. The three objectives to accomplish this goal are to develop and diversify the workforce force in life sciences; to advance research on data visualization and enhance public understanding of the science of climate variability and its impact on marine life; and to facilitate business innovation and educate institutions and investigators regarding technology transfer.

Notably absent however is any mention of the primarily undergraduate institutions and indicators for research growth such as increased opportunities for project-based learning for students or faculty release time to conduct research (more discussion is provided in the section on Building and Strengthening Research at All Rhode Island Undergraduate Institutions.)

In order for the strategic plan to be a useful program management tool, one area of the strategic plan that needs considerable work is the evaluation section including the logic model. Given the catalytic intent of NSF EPSCoR funding, it will be important for Rhode Island EPSCoR to demonstrate how the current five-year investment ($20 million) has elevated the competitiveness of the state compared to where it sits today. This will be a critical piece when it comes time to renew the grant in three years and thus needs more attention at this time.

The panel recommends that Rhode Island EPSCoR establish clarity on connecting the scientific, education, and partnership goals with outcomes that are indicative of success. The logic model includes about a dozen objectives (numbered differently than an earlier section of the strategic plan) along with corresponding activities, outputs, outcomes, metrics, and timelines. While the framework may be appropriate, the descriptions therein require more thought and should be connected to the vision for the program. For example, while more publications, funding, and training for students are useful quantitative indicators for research productivity, it is recommended that Rhode Island EPSCoR probe deeper and articulate more specific indicators of success for the program. In other words, where does Rhode Island EPSCoR aspire to be after five years of funding? This question needs to be posed for all areas of the program whether in research, education, and outreach. If the goal of the program is to establish more collaborations across the state, then a target or indicator of success could be that a portion of the publications are co-authored between partner institutions over the course of the award (which could then be compared to the same indicator from the previous RII award). Given the nature of the research questions of Rhode Island EPSCoR and the dynamic field of marine microbiology, measures of success could include publications that integrate several disciplinary areas (marine microbiology and “omics”) or in publications that demonstrate cutting-edge cross-disciplinary sciences (e.g. new
visualization tools). The point here is that the program should begin to articulate what some of these measures would look like, while leaving room for unconstrained outcomes that are naturally associated with discovery research.

C. Integration

Since the inception of the Rhode Island EPSCoR, the leadership and participants have emphasized that the small size of the state is a strength and provides close proximity for all participating institutions. This geographical closeness was described to the AAAS review panel as a key to scientific cooperation, collaboration and sharing of resources that would not be possible in larger states. Over the course of the previous round of RII funding, there have been many examples of how this proximity has been an asset, most notably with student training and outreach programs, allowing students to easily cross between institutions during the summer months without overly complex logistical issues such as housing. In the current round of RII funding, integration of the programs will be evaluated more closely and will involve more than convenience of meetings and logistics. The ability of the programs to integrate programs and resources to most efficiently leverage success and expertise will become more and more vital, especially in a time of increasing economic challenge at both the state and federal level.

The Rhode Island EPSCoR core facilities have made great strides in their development but remain predominantly used by their respective local investigators. The continued development of transinstitutional usage, incentives, and assessment will be important for continued success and future development of the core facilities. The most notable opportunities are the expansion of the Brown bioinformatics capabilities to support investigators throughout Rhode Island EPSCoR. The bioinformatic capabilities can be an effective tool to bring projects and investigators together as well as serve an important teaching and training tool. Currently, the staff of one expert informatician limits the ability to expand the program immediately, but this model, which already has generated URI users that are happy with the service, should serve as a good foundation for growth. The genomics cores at URI and Brown also have significant opportunity for integration and sharing of resources and technology, as discussed in the core facility section of the report.

The tools for communication within and about the Rhode Island EPSCoR, especially in regards to the presence of multiple websites, have made progress but opportunities remain to unify the sites and content. This includes establishing a relationship between the RISD collaboration website and the content being developed by the Rhode Island EPSCoR administrative staff on the Rhode Island EPSCoR official website. Currently, the two are mutually exclusive but would both benefit from a more unified approach. Similarly, the RISD STEM to STEAM initiative has tremendous potential that will gain traction in both the educational field and the public, but it also has significant opportunity for integration with traditional STEM initiatives that have been underway at CCRI and the primarily undergraduate institutions (PUIs). The AAAS review panel recognizes that RISD is seeking connections with the STEM program at the PUIs, which provides
confidence that this integration will become more substantial and lasting. The STEM to STEAM initiative has the potential to be an example of success for the Rhode Island EPSCoR and will differentiate Rhode Island not only from other EPSCoR programs but also national research programs.

Overall, the Rhode Island EPSCoR has leveraged the geographical closeness of its participating institutions and now has the opportunity to further integrate its intellectual resources. The program is encouraged to continue to identify complementary assets that will enable synergistic opportunities.
Marine Biosciences Research: Attaining National Recognition

When the Rhode Island EPSCoR was initiated in 2006, the original goals were broadly defined by leveraging the state’s resources in marine sciences towards microbial genomics and the nitrogen cycle, the ecological genetics of environmental stress, biogeography and climate change, characterization of molecules that mediate interactions within and between organisms and marine bio-prospecting to identify new pharmaceuticals and natural products with potential for commercial development. While the original goals have not been completely abandoned, the current program has developed a timely and wise strategic plan to focus on strengthening Rhode Island as an international leader in understanding and predicting the response of marine organisms and marine ecosystems to climate variability. Rhode Island EPSCoR seeks to take advantage of the close proximity of all state institutions to foster new collaborations, especially by integrating the use of core facilities, expanding data sharing and communication through newly-installed cyberinfrastructure, and working with the Center for Computation and Visualization at RISD.

Within Rhode Island, the URI plays a leadership role in marine biosciences, which complements the leadership role that Brown plays in biomedical research. Both programs have grown in maturity and interact well with research conducted at the other partner institutions. Prior Rhode Island EPSCoR investments at the GSO campus are already beginning to show dividends, as evidenced from URI faculty development, extramural funding, and educational opportunities (Catalyzing a Life Science Research, Education, and Innovation Network, University of Rhode Island’s Final Report, 2010).

The scientific presentations from URI faculty members were high quality, timely and exciting. Rhode Island EPSCoR and URI in particular should continue to incentivize high quality, extramural-supported research and continue to recruit high-caliber junior faculty. The program is in a good position to build on the success of its research programs, which will elevate the profile of Rhode Island both nationally and internationally. This has already led to political support and recognition of the power of Rhode Island EPSCoR in economic development by state and local agencies and representatives.

Core Facilities to Support Research Competitiveness and Education

The Rhode Island EPSCoR provided major support for three core facilities in 2006 through its initial RII award and has been developing those facilities over the course of the last five years. Each of the core facilities is functioning well, has strong leadership and technical staff and is contributing in a meaningful and significant manner to the research enterprise of the participating institutions. During the site visit, there was an emphasis on reviewing the sustainability and financial models for the three facilities.
These discussions are a vital step towards developing long-standing and sustainable core facilities.

The proposed model for sustainability is very reasonable from an operations perspective in that user fees will cover the day-to-day operations for the facilities. The user fees appropriately reflect subsidies provided by funding mechanisms such as Rhode Island EPSCoR as well as other grants and institutional commitments. The efforts of Brown and URI to establish clear institutional policies regarding management of the core facilities, as well as clear policies for financial accounting, budgeting and reporting, should be applauded. This level of oversight was noted as an area for attention in previous AAAS reviews and the leadership has made significant efforts to address the management and sustainability of the core facilities.

The next phase of development for the core facilities is to enhance the sustainability model beyond day-to-day operations to include development of additional resources and plans for equipment replacement and upgrades and the development of new services and assays to keep pace with the research needs of the investigators. Currently, the core facilities are not allowed to operate with any type of surplus carrying over year to year, nor is there a policy to allow capital equipment to be included in rate calculations for a given year. This causes the core facilities to rely on institutional commitments and/or proposal writing by the core facility leadership or other faculty members to support new equipment purchases. While this model has been very successful in the past, it does make it difficult for the cores to be dynamic and respond to emergent needs.

The Rhode Island EPSCoR leadership should consider working with institutional leadership to establish some policies and ideas that may allow the core facilities to respond to equipment and staffing needs in a rapid manner or allow the budgeting for equipment needs in an annual budget. These recommendations are made with the understanding that institutional policies must be considered and there may be limitations with respect to capital equipment.

In summary, day-to-day sustainability models are in place and the cores are functional and clearly effective. The panel now suggests planning for the next phase of core facility development and growth to continue to support the research, educational and training enterprise at the institutions.

A. Marine Life Science Facility

The Marine Life Science Facility provides a world-class research space with the ability to create and control a wide variety of seawater environments, thereby mimicking nearly any ocean condition on the planet. This facility is a vital centerpiece to the strategic plan of becoming recognized as a world leader in environmental and biological oceanography.

The AAAS review panel is impressed by the facility and the research it enables. A one-stop-shop for marine sample preparation has tremendous utility for faculty and students
and will also facilitate a streamlined integration with the proteomics and genomics facilities. This has been a long-standing goal of the Rhode Island EPSCoR that is very close to becoming a reality.

The research infrastructure at the GSO will continue to develop according to the strategic plan and its use in high-impact research and education programs continues to increase. The GSO infrastructure has two major components: the Aquarium and the Molecular Ecology Prep Lab.

First, the Marine Life Science Facility underwent major renovations during the first RII award (ongoing maintenance and changes are typical for facilities such as this) and is contributing to research programs in Rhode Island EPSCoR. In addition, renovations to laboratory space and equipment purchases will continue. Currently the operations of the Marine Life Science Facility supports the growth and maintenance of a wide range of organisms, provides equipment and research space, and serves as an important education and outreach component.

Second, the planned purchase of flow cytometry equipment will enable more advanced characterization of organisms grown at the facility, thereby enhancing research programs at the GSO and also significantly enhancing the capabilities of the other Rhode Island EPSCoR institutions, especially the undergraduate institutions.

Third, and related to the flow cytometry equipment purchases, the renovation and completion of the preparation room and wet laboratory capabilities will provide an important adjunct to the other Rhode Island EPSCoR core facilities. There is a clear capability now in place to allow an efficient route of access from growth of organisms in the Marine Life Science Facility to their preparation in the wet laboratory to analysis in the genomics or proteomics core facilities. Looking ahead, the Rhode Island EPSCoR will need to consider how to develop and support complete workflows that truly leverage these unique capabilities, as opposed to viewing them as loosely linked but separate facilities.

Areas that will require further work by the leadership team include evaluation of the financial needs of the facility and ensuring that facility support is written into grants and charged to outside entities. The next step is to determine how the facility will be maintained in the long term, which will involve analyzing the costs for maintenance, repair, and sustainability, and developing an appropriate plan. Unlike the genomics and proteomics facilities, a detailed analysis of sustainability for the Marine Life Science Facility is not available yet.

B. Proteomics Facility

The goal of the Rhode Island EPSCoR proteomics core facility, located at Brown, is to support the proteomics needs of the participating institutions and investigators. The facility was founded as an instrument access facility that saw relatively little use by
investigators outside of Brown. The facility began offering support services beyond instrument access to include full-service support for mass spectrometry. The facility had technology upgrades in its mass spectrometry instrument in 2008 and 2010. The leveraging of NIH funding to enhance a central core facility is an excellent testament to the collegial philosophy of the Brown and Rhode Island EPSCoR faculty, illustrating that the sustainability model that is currently in place may indeed be successful even though it relies on the continued efforts of faculty to write successful equipment grants.

There are 43 total users of the facility. Although more than half are from Brown, access to the facility by investigators throughout the Rhode Island EPSCoR is not limited, alleviating concerns with faculty from other institutions being able to access the facility and receive fair and equitable use.

The next phase of development for the proteomics core facility is reporting the usage based on a percentage of use and/or capacity. For example, the reported usage from Brown over the past year was 23 users out of a total of 43. What is not clear is if these 23 users consumed 52% of the capacity. In other words, how much more capacity is available within the proteomic core? Further, it is noted that 52 peer-reviewed publications were supported by the proteomics core, but it was not clear how many of those manuscripts acknowledged the Rhode Island EPSCoR grant, how many were from Brown, and how much of an increase that number was over the previous year. Overall, reporting and assessment is much improved for the core facilities, but additional efforts can be made to connect research success and development to the Rhode Island EPSCoR.

The proteomics facility has supported an outstanding $12.3 million in grant funding. Similar to the issue mentioned above with respect to publications, it would be helpful if the sources of this funding were made clear. Finally, the leadership of the proteomics core should consider developing ways to describe how the facility has enhanced the research at Brown and other Rhode Island EPSCoR institutions. It would be a powerful statement about the impact of Rhode Island EPSCoR to describe projects that were enabled due to the unique resources and leadership of the core. The AAAS review panel was told of anecdotes from individual investigators that complimented the facility but the panel would like to see this reporting carried out in a much more systemic fashion.

C. Genomics and Sequencing Center

The Rhode Island Genomics and Sequencing Center was established in 2002 to provide technical and analytical assistance for molecular and genomics researchers at the URI. In 2006, the center was expanded with Rhode Island EPSCoR funding to provide access for all Rhode Island higher educational institutions. Now, the mission of the center is to provide cutting-edge genomic technologies to Rhode Island investigators, to facilitate interdisciplinary genomics research within the state of Rhode Island, and to provide undergraduate and graduate student training opportunities.

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6 The Genomics and Sequencing Center at URI is NSF EPSCoR-subsidized, which is separate from the genomics center at Brown.
A sustainability and business model plan was also developed for the URI genomics core facility. Concerns about sustainability and development for the genomics facility are similar to those described for the proteomics core. The genomics facility is not able to budget for capital equipment upgrades or retain operating overages, therefore limiting the ability of the facility to be dynamic in a rapidly-changing technology field. That said, the genomics facility is well managed, well used and is a rapidly-growing facility. The year-over-year growth in the sequencing business has been significant and equipment access and availability remains excellent. Overall, the genomics facility is a superb facility that meets the needs of the Rhode Island EPSCoR users. The facility leadership correctly expressed concern that the per-sample fees will become non-competitive with commercial providers once the Rhode Island EPSCoR funding goes away. While that is true, it should not discourage continued support of the facility as it is enabling research. However, this is a reason for not expanding or upgrading the in-house Sanger sequencing instrumentation, because its long-term viability would be in question.

The current RII award will support the purchase of a next-generation sequencing instrument for the URI Genomics Core. The original proposal described a Roche 454 FLX instrument. The use of this sequencer was discussed in detail during the research presentations at the GSO and the genomics components of several of the projects was very clear. A Pacific Biosciences RS system was also mentioned and it appears that this instrument will likely be purchased instead. Given that sequencing is rapidly evolving field, and there is a recently-purchased and quite under-utilized Illumina HiSeq instrument available, the AAAS review panel recommends that the purchase of the Rhode Island EPSCoR-funded instrument be delayed until a more thorough decision can be made based on newly emerging technologies, the precise needs of the investigators, and the capacity and capabilities of the Brown genomics facility (the latter is not part of the Rhode Island EPSCoR but is described as an available resource). From an institutional perspective, it would be advantageous for both Brown and the Rhode Island EPSCoR to leverage the existing high-performance sequencing capacity in the Brown facility with expertise available at the URI facility.

One possibility for leveraging is to have the URI facility prepare Illumina sequencing libraries as a full service operation similar to the manner in which it currently prepares sequencing samples for analysis on its existing equipment. These samples would then be combined with samples prepared by Brown investigators and, together, the combined samples would make better use of the currently under-utilized equipment at Brown. Using this model, a decision about the purchase of another high-performance instrument could be made with direct evidence from user needs rather than estimated plans. Additionally, it would provide more time for newer platforms such the Pacific Biosciences to mature and be evaluated.

The genomics facility reported substantial year-over-year growth in the number of samples processed and claimed support of $25 million in extramural funding. As mentioned for the proteomics facility, the breakdown of funding sources from NSF, NIH, the institutions, and other sources, would be beneficial in appreciating how much of the
facility growth is directly related to the Rhode Island EPSCoR. Additionally, it would be beneficial for the leadership of the facility to describe projects that were enhanced or enabled by the technologies that are supported in the facility.
Cyberinfrastructure to Foster Collaboration Across Rhode Island

The progress made on the cyberinfrastructure over the past year has been impressive and illustrates the effectiveness of many entities in the state working towards a common goal. After being successful in receiving funding from three different funding sources, including the NSF, these awards were leveraged to achieve access to more regions of the state. Nearly all high schools and libraries are connected now on a dedicated fiber optic backbone that runs throughout the state, connecting all research institutions and educational systems. This connectivity will enable substantial use of interactive learning modules, allow video conferencing and streaming, and support a rich opportunity for economic development. The experienced management and development of these resources is impressive. The success in cyberinfrastructure development exemplifies the ability of Rhode Island to come together as a state and accomplish a substantial goal that will have wide-reaching effects on its educational, research and economic development efforts. Current RII Track I funding will support further efforts to enable high-speed transfer of large data sets among researchers in Rhode Island, hiring of faculty members to meet the growing needs in bioinformatics, and enhancing the Center for Computation and Visualization by expanding its user base.
Design, Data Visualization, Communication, and Interdisciplinary Collaborations

The Rhode Island School of Design (RISD) is a new research partner within Rhode Island EPSCoR and opens up unique and exciting opportunities in research collaboration, communication, and visualization. It is readily apparent that this partner has contributed to the project team in terms of its objectives, deliverables and most importantly, it provides a distinctiveness to the Rhode Island EPSCoR as compared to other EPSCoRs in the country.

The stated research goals of RISD in the Rhode Island EPSCoR are to: i) make science visible by developing visual techniques and communication strategies for scientists; ii) make science accessible by developing visual techniques and communication strategies to communicate the significance of scientific findings to broader audiences; iii) create collaborative environments by facilitating successful interdisciplinary research among artists, designers and scientists; and iv) promote STEM to STEAM by demonstrating the value of art, design, and science collaborations for research and education in the STEM disciplines.

These goals are framed in a way that supports the participation of RISD faculty members and students as value-added partners insofar as it brings a set of skills and knowledge that is not found in any other participating institution and is unique to the Rhode Island EPSCoR. These goals also place RISD in a leadership role for the broader impacts objectives and deliverables. While this is a strategically-sound decision for both RISD and the Rhode Island EPSCoR, it is critical that RISD’s participation is integrated in all aspects and stages of the larger research program. The project team at RISD and Rhode Island EPSCoR do appreciate this need and they are encouraged to continually pursue this direction.

In addition, the goals are closely integrated to the larger institutional and pedagogical mission of RISD. For example, this includes the introduction and integration of the STEM to STEAM initiative within RISD. The school has begun a systematic process of advocating the development of art and design practices that engage the challenges of STEM education both within the institution and beyond. The notion that art and design education can become valuable pillars in the teaching and learning of STEM is reciprocated for arts education – i.e. that STEM education is a valuable means to enhance the education of artists and designers and this has become an important institutional mission of the school. In addition to plans to build their capacity to support such a pedagogical and research mission, RISD has supported the creation of several, distinct science-related courses in their curricula (including the science of global environmental change and a new nature, culture and sustainability concentration); enhanced their microscopy capacity through new equipment located in their already significant Nature

It is worthwhile to mention that in 2010, RISD hosted an NSF-supported workshop on STEAM as a means to instigate a larger national dialogue around the critical relevance of art and design education in STEM.
Lab; and begun a process of aligning their liberal arts courses to the larger research
objectives and themes of Rhode Island EPSCoR.

While it is laudable that the school is rethinking and enhancing its liberal arts offerings,
especially by including science courses to enhance the capacity to train its art and design
students, it is strongly encouraged that RISD consider partnering with other Rhode Island
EPSCoR institutions to explore more cross-listed, jointly-developed and jointly-taught
courses in order to optimize their resources and benefit fully from the expertise of their
partners. Though it was indicated during the visit that this might be difficult due to cross-
institutional coordination of course schedules and differences in times of their respective
semesters, the long-term sustainability of these partnerships is a great incentive to begin
some collaboration and coordination in this area.

The STEM to STEAM approach to cross-fertilize art and design into STEM and vice
versa is sound; however, it would be useful for RISD and other Rhode Island EPSCoR
partners to continue to refine their pedagogical and research objectives in relation to the
evolving value and clarity of the STEAM mission. For example, the AAAS review panel
recommends having annual reviews of the curricular goals of related courses to ensure
that the full potential of STEAM learning is being enabled within the courses.

RISD has also developed several mechanisms for supporting collaborations between
designers and scientists. Rhode Island EPSCoR will support the creation of studios
(project-based studio learning opportunities) that draw on important themes related to the
research program. The organizing credo of these studios seems to be the exploration
(through documentation and careful study) and furthering of effective art-science
collaboration. Thus far, the RISD team has initiated one such studio, Hypothesis Studio
(spring 2011), and integrated some aspects of such collaboration into an existing course,
Digital Nature Studio (winter session 2011). The Hypothesis Studio focused on
providing RISD students and faculty opportunities to learn more about and document
some of the scientific research undertaken by Rhode Island EPSCoR researchers. The
studio seems to have gathered valuable information that could be used to strategically
orient approaches to making the research visible and accessible to a broader audience as
well as developing effective art-science collaborations. The Digital Nature Studio
involved collaborative teaching between RISD and URI marine biology faculty. Another
important initiative is the establishment of a Scientist in Residence at RISD through
Rhode Island EPSCoR – a marine genomics scientist from URI will be in residence at the
school from 2011-2012 to collaborate with designers on data visualization.

The sponsored studios to explore the nature of cross-disciplinary collaborations between
arts and science (e.g. Hypothesis Studio) are a great start to understand the Rhode Island
EPSCoR research areas and the working methods and assumptions of scientists. While
this endeavor is valuable, it is critical for the school to begin charting out how these
initiatives will be developed further for actual and meaningful art-science collaborations
in the near future. One way to do this might be to identify a few key research projects that
form the basis for a collaborative studio where artists, designers, and scientists work and
learn together. It is also useful to clarify the research objective (which includes
understanding the nature of art and science collaborations) from the objective of enacting successful art-science collaborations. This is to ensure that the deliverables for each of these objectives are well developed.

The strategy to develop Rhode Island EPSCoR-focused studios alongside integration of Rhode Island EPSCoR-related content into existing studios is critical for the long-term success of these initiatives for the institution and is laudable. For future planning purposes, it would be useful for the school to develop a long-term plan to show how RISD would systematically reduce its dependence on Rhode Island EPSCoR funding to maintain these programmatic changes.

The creation of studio learning opportunities also opens up the potential and challenges for making science accessible and visible. The school launched a sponsored studio, Crisis of Representation (spring 2011), to learn about the issues involved in the visual representation of anthropogenic climate change. In addition, it will have two graphic design studios examining scientific visualization and one on experimental data visualization in fall 2011. The school has also continued to explore platforms for the presentation of scientific visualization through experimental investigations on G-Speak, its spatial operating system for gestural interaction.

Finally, the RISD team has also developed a site, expspace, for the documentation of the research interests and the presentation of participating researchers’ biographies, in order to promote interdisciplinary collaborations. The site is a great beginning but it is unclear how and if this site and its content will be effectively calibrated with the content of the homepage of the Rhode Island EPSCoR website. It will be useful to have the RISD web team work closely with the Rhode Island EPSCoR administration team to ensure that there is effective cross-referencing and calibration of content.

There are many strengths to the RISD partnership and their involvement within Rhode Island EPSCoR. The school’s faculty members and leadership have taken a serious approach to their involvement, are actively engaged in the Rhode Island EPSCoR, and have clearly worked towards integrating the goals of Rhode Island EPSCoR into their larger institutional mission. This paves the way for sustainability of these initiatives beyond Rhode Island EPSCoR funding, and provides the foundation for leadership in research collaborations between designers and scientists.
Building and Strengthening Research at All Rhode Island Undergraduate Institutions

The goals of the Rhode Island EPSCoR RII award are to increase research competitiveness and to build an inclusive foundation for collaboration among educators and investigators in the state. These goals are well aligned with the values of the Rhode Island PUIs and members of these schools agree that these goals are important to advancing the mission of their respective institutions. Indeed, Rhode Island undergraduate institutions have made significant advancement towards these goals during the previous RII award. Highlights and achievements include the program offered by CCRI which is educating a new generation of life science students and the SURF program, which is an excellent vehicle to introduce Rhode Island undergraduates to research. The statewide infrastructure in genomics, proteomics, and marine resources offer transformative opportunities on courses, curriculum, and faculty hires at Rhode Island undergraduate institutions.

Rhode Island undergraduate institutions are now well positioned to advance research competitiveness and to continue to build collaborations with the current RII award. The Rhode Island-STEM Center at RIC, working closely with the Providence After School Alliance (PASA), promotes the STEM disciplines to a younger group of middle school students. Continued collaborations and interactions of the Rhode Island-STEM Center with Rhode Island EPSCoR and the CCRI Biotechnology Program will ensure that Rhode Island educational programs are fulfilling the Rhode Island EPSCoR mandate to increase STEM knowledge within the state. The SURF Program at RWU provides an important foundation to merge the educational and research goals of Rhode Island EPSCoR; STEM programming should continue to evolve by including educational skills into the program (e.g. writing, oral communication, and leadership skills).

Education is the primary mission of all Rhode Island undergraduate institutions; nevertheless, the research infrastructure of Rhode Island is growing and the AAAS review panel urges continued collaborations between Rhode Island undergraduate institutions with others in Rhode Island EPSCoR as well as increased usage of the core facilities, as research becomes even more infused into the undergraduate culture. Further, the AAAS review panel is pleased to see that representatives from the undergraduate institutions are team leaders in all three research questions of Strategic Goal 1 (to engage in collaborative competitive research in marine life science). This is a positive sign that research at PUIs is valued and they have much to gain by collaborating with other institutions. In parallel, it is important that Rhode Island EPSCoR include representatives of PUIs at all levels of the Rhode Island EPSCoR organization. The AAAS review panel agrees that it is appropriate to include a PUI investigator as a co-PI on the Rhode Island EPSCoR (as described in the section on Leadership and Management). Based on the previous RII award, the Rhode Island EPSCoR has had a significant impact on the undergraduate institutions in the state as demonstrated by their ability to compete for highly-talented faculty and students. The AAAS review panel urges the undergraduate institutions to take advantage of this increased competitiveness by capturing their
successes and making arguments for increased growth and development (or at least flat budgets in these difficult financial times).

Despite the gains in research participation of undergraduate institutions since the start of Rhode Island EPSCoR (in 2006), there are a few concerns. First, the goals of the Rhode Island EPSCoR Academy are broad and far-reaching, and many organizations contribute to the Academy mission. The Academy should select and articulate strategic areas (and evaluation metrics) where it is likely to have the most impact. The leadership of the Academy Director is of paramount importance to ensure that these organizations and institutions are well integrated, working synergistically, and evaluating the outcomes. The Academy Director’s position has been difficult to fill (this is the third Director the AAAS review panel has met in five years and the position was open during last year’s visit); nevertheless, the highest priority should be placed on hiring a person to fill this position with good organizational and communication skills and whom the PUIs respect.

Furthermore, while their goals align with the overall mission to increase research competitiveness, undergraduate institutions require different assessment measures than research-focused institutions. For example, the number of publications and presentations might be a good measure for research competitiveness at research institutions, but enrollment figures, attitudinal perceptions towards research, and summer research student outcomes may better capture undergraduate research efforts and improvements. Thus, each institution needs to define their goals, determine their desired outcomes, and assess these outcomes. The Academy Director will play an important role in assessment of the undergraduate institutions, data collection, and analysis including faculty development and student outcomes. The Academy Director is an important voice for the undergraduate institutions and it is important that the Academy Director measure the impact of Rhode Island EPSCoR on undergraduate institutions collectively and challenge PUIs to be accountable for their support.
Appendix A

Panelists (staying at the Providence Marriott Downtown, 1 Orms Street, Providence RI):

- Rieko Yajima, Project Director, AAAS
- Herm Lehman, Professor and Chair, Department of Biology, Hamilton College
- Shawn Levy, Faculty Investigator, Hudsonalpha Institute for Biotechnology
- Gunalan Nadarajan, Vice Provost for Research, Maryland Institute College of Art
- Terry Gaasterland, Professor and Director, Scripps Genome Center, Scripps Institution of Oceanography; University of California, San Diego
- Bob Gagosian, President, Consortium for Ocean Leadership

Sunday, June 5th

7:00pm – Welcome Dinner at Local 121 (121 Washington Street, Providence RI, complementary valet parking)

Moderator – Peter Alfonso

Other Participants: Jennifer Specker, David Bogen, Edward Hawrot, Bradley Moran, Christine Smith, Pamela Swiatek, Sara MacSorley, Philip Velliette

Monday, June 6th

8:30-9:00 – Working breakfast for the panelists
URI Narragansett Bay Campus, Coastal Institute, Small Conference Room

9:00-11:45am – URI Narragansett Bay Campus, Coastal Institute, Large Conference Room

Moderator – Jennifer Specker

9:00-9:30-Welcome, Jennifer Specker
9:30-10:00 -Adaptations, David Rand
10:00-10:30 -Food Webs, Bethany Jenkins
10:30-11:00 - Pathogens & Parasites, Chris Lane
11:00-11:10-Break
11:10-11:45 - Marine Life Science Facility & Tour, Tatiana Rynearson, Ed Baker, and Andrea Drzewianowski

Other Participants: Philip Veillette, Sara MacSorley, Kate Wilson, Shelley Hazard, Rebeka Merson, Susanne Menden-Deuer, David Nelson, Patrick Ewanchuk, Liz Harvey, Melissa Mercier, Jeff Mercer, Patrick Flight, Kerry Keenan

12:15-1:45pm- Lunch at University Club, URI Kingston – President’s Room (Upper College Rd)

Moderator – Jennifer Specker

Entrepreneurial Fellowship Program with Slater Technology Fund, Rich Horan
Other Participants: Sara MacSorley, Philip Velliette, Bogdan Prokopovych, Rachel Decker, Kate Wilson, Jim Pettell

2:00-5:00 pm – URI Kingston Campus, Center for Biotechnology and Life Sciences, Room 152 (Flagg Rd)

Moderator – Bradley Moran

2:00-2:45 - Genomics Center Presentation and Tour, David Nelson and Paul Johnson
2:45-3:00 - Break
3:00-4:30 - Sustainability/Business Plans, Pam Swiatek and Catherine Curtin-Miller

Other Participants: Jennifer Specker, Philip Veillette, Sara MacSorley, Shelley Hazard, Kate Wilson, Laura Beauvais, Tatiana Rynearson, Rebeka Merson, David Rand, Susanne Menden-Deuer, Bethany Jenkins, Chris Lane, Patrick Ewanchuk, Alla Peselis, Shelley Brown, Mary Niebels, Mike Milkman, David Leibovitz, Ed Baker, Andrea Drzewianowski, Mary Kate DeMarco, Franca Cirelli, Kerry Keenan

6:00 pm – State Alignment Dinner at 1149 Restaurant, Private Room (1149 Division Street, Warwick RI)

Moderator – Christine Smith

Other Participants: Peter Alfonso, Edward Hawrot, Jennifer Specker, Philip Velliette, Laurie White, Clyde Briant, Keith Stokes
Tuesday, June 7th

9:00-11:45am – Rhode Island School of Design, Waterman Building (13 Waterman Street, Providence RI), Start at Nature Lab on 2nd floor, end at the Foundation Studies classroom 11

Moderator – David Bogen

Making Science Visible, Charlie Cannon and John Dunnigan

Other Participants: Peter Alfonso, Marie Cieri, Lindsay Kinkade, Chris Rose, Neal Overstrom, Clement Valla, Sarah Ganz Blythe, Shawn Greenlee, Stacy Risemen, Jennifer Specker, Sara MacSorley, Philip Veillette, Edward Hawrot, Kate Wilson, Susanne Menden-Deuer, Tatiana Rynearson, Marta Gomez-Chiarri, Bethany Jenkins, Hypothesis Studio Students, Lingsheng Dong, Roxanne Smolowtiz, Kerry Keenan

12:15-1:30pm – Pizza Lunch and Communications Presentation, Sara MacSorley and Kate Wilson
Brown University, 70 Ship Street, Providence RI, Room 106

Moderator – Jennifer Specker

Other Participants: Philip Veillette, Pamela Swiatek, Edward Hawrot, Lingsheng Dong

1:30-5:00pm – Brown University, 70 Ship Street, Providence RI, Room 107

Moderator – Edward Hawrot

1:30-1:50 - Proteomics Center Tour, Jim Clifton
1:50-2:15 - Genomics Center Tour, Christoph Schorl
2:15-2:45 - Cyberinfrastructure – The Big Picture, George Loftus, David Porter, Jaime Combariza, and Stuart Freiman
2:45-3:00 - Break
3:00-3:20 - Cyberinfrastructure EPSCoR and Brown, Jaime Cambariza
3:20-3:40 - Bioinformatics, Lingsheng Dong
3:40-4:00 - Proteomics, Jim Clifton
4:00-4:30 - Brown Faculty Presentation

Other Participants: Jennifer Specker, Philip Veillette, Sara MacSorley, Kate Wilson, Jan Hesthaven, Pamela Swiatek, Alisson Walsh, Roxanne Smolowtiz, Kerry Keenan

6:00pm – Dinner at Bluefin Grille at the Marriott Hotel, Panel only, Reservation under Rieko
Wednesday, June 8th

8:30-11:45am – The Rhode Island STEM Center at RIC, Henry Barnard School, Room 214

Moderator – Philip Veillette

- 8:30-8:50 - STEM Center, Mary Sullivan
- 8:50-9:05 - The Academy, Philip Veillette
- 9:05-9:25 - SURF, Jim Lemire
- 9:25-9:45 - G6-12 outreach, Tim Pelletier
- 9:45-10:00 - Break
- 10:00-10:30 - RWU&Bryant, Dan McNally
- 10:30-11:00 - Salve&PC, Sheila AdamusLiotta
- 11:00-11:30 - CCRI& RIC, RebekaMerson
- 11:30-11:35 - Closing, Philip Veillette

Other Participants: Lisa Zuccarelli, Elisabeth Arevalo, Sara MacSorley, Jennifer Specker, Kate Wilson, Shelley Hazard, Kerry Keenan

12:00-3:00pm – Closed panel session, Lunch delivered from LaSalle Bakery
STAC, Providence Room

3:00-4:00pm - Debrief Principal Investigator
STAC, Providence Room
Participants: Peter Alfonso, Jennifer Specker

4:00pm – Depart
Appendix B

Research Infrastructure Improvement Goal I
Intellectual Merit

Advance Rhode Island's competitiveness in marine life science by acquisition of cutting-edge equipment to enable studies on the genomics, proteomics, and metabolomics of marine organisms by integrating the three Core Facilities, through an expanding Cyberinfrastructure, with each other and with the Center for Computation and Visualization.

Strategic Goal 1 - Engage in collaborative, competitive research in marine life science

Strategic Goal 2 - Enhance core infrastructure and expand user base

Strategic Goal 3 - Build Cyberinfrastructure and capacity in computational biology

Research Infrastructure Improvement Goal II
Broader Impacts

Build an inclusive foundation for collaboration among educators and investigators in the state, integrating life science research training both horizontally across institutions of higher education and vertically with pre-college teachers and students, thereby fostering equal opportunity.

Strategic Goal 4 - Develop and diversify the workforce in life sciences

Strategic Goal 5 - Advance research on data visualization and enhance public understanding of the science of climate variability and its impact on marine life

Strategic Goal 6 - Facilitate business innovation and educate institutions and investigators regarding technology transfer