BUILDING THE FUTURE AT THE UNIVERSITY OF RHODE ISLAND

Research, Innovation & Economic Growth

URI Commission for Research & Innovation
Report and Recommendations

OCTOBER 2008

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I. URI and Rhode Island's Economic Future

Throughout the world, research universities act as critical engines for innovation. The most fundamental threats and opportunities facing humankind—poverty and disease, climate change and energy production, for example—all depend on research to generate the understanding necessary to develop processes and products to address them. Such research activity has been vital in fueling the explosive technological growth of the past few decades. The impact of research universities is so significant that, local to their geography, they are now strong stimulants of economic growth.

The link between university research and economic development is well documented.[1,2] The outputs of research universities can lead directly to the commercialization of new ideas and encourage the creation of high-wage jobs. As engines of innovation, research universities provide businesses with the information and tools they need to respond to changing conditions, tap into new markets, develop new products and processes, and compete in the global innovation economy.

Universities also stimulate economic development through technology transfer (i.e., the commercialization of research findings through the creation of start-up companies), creating partnerships with business and industry, and fostering a culture in which innovation is rewarded.[3] Public research institutions not only foster innovation, but provide access to higher education—an increasingly important aspect of producing an educated workforce. In order to compete globally both now and in the future, the United States must train a flexible and skilled workforce prepared to work in knowledge-based innovation economy jobs. This training is best accomplished by engaging students in an environment where creativity and innovation are practiced and rewarded. Competitive research universities offer our communities and our country precisely this kind of workforce development tool.

Forward-thinking states view their public research institutions as the nucleus of their economic development strategy. Look beneath the surface of any successful state economic development plan, and you will find this common building block: a strong, well-supported, public research university or university system. In Rhode Island, the economic future of the state goes hand in hand with the success of its public research university: the University of Rhode Island (URI). The jobs of the future increasingly require undergraduate and advanced degrees in science- and technology-related fields, and a strong research presence in the state is vital to creating those jobs in Rhode Island and keeping them here.

Recognizing the importance of URI to economic development in Rhode Island, in 2006 the Rhode Island Science and Technology Advisory Council (STAC) recommended the creation of a Commission focused exclusively and specifically on URI and its research enterprise, with an aim toward nurturing its ability to support and grow an innovation economy in Rhode Island. Later that year, the Rhode Island General Assembly passed, and Governor Donald L. Carcieri signed into law, legislation creating the URI Commission for Research & Innovation.

[1] In this report we use the term "research" to mean basic research in science, technology, engineering and mathematics (STEM). Research in the humanities and applied technological research also make strong contributions to our quality of life. But the focus of this report is on research as a source of sustainable economic growth, which explains our narrow usage of the term.

[2] For more on the link between university research and economic development, see Appendix C.

[3] Louis G. Tournatzky, Paul G. Waugaman, and Denis O. Gray. 2002. Innovation U.: New University Roles in a Knowledge Economy. Southern Growth Policies Board.

The nine-member Commission was formed in October 2007 (see Appendix A for biographies of the Commissioners) and charged with proposing specific actions to strengthen the position of URI as a nationally competitive public research university and a key institution in Rhode Island's effort to strengthen its innovation economy. The Commission was asked to evaluate URI's current position and formulate recommendations that:

- Grow the size, significance and competitiveness of URI's R&D programs;
- Produce a larger, better trained workforce in science and technology; and
- Increase the levels of industry involvement in URI's research programs and technology transfer/commercialization activities.

Many important programs introduced at URI over the past decade have served to strengthen the University's general standing as an institution of undergraduate education. Under the leadership of President Robert Carothers URI significantly increased undergraduate enrollment, attracted more highly qualified students from out of state, and made significant improvements in academic and student life. The scope of the Commission's work has been narrowly focused on URI's current research activity and the steps the University must take to strengthen its research capacity. It is important to acknowledge the many accomplishments and strengths of URI that lie outside the scope of this report—accomplishments that are significant in their own right.

The Commission has determined that URI lags far behind its local and national peers, as detailed in this report. Commissioners are acutely aware that today, economic competition is global in scale and that throughout the world, particularly in China, India, Japan, Korea, and Singapore, substantial financial resources are being dedicated to growing and sustaining strong research universities. These investments are being made in full awareness of their long-term value. This value is not only a matter of money, but of creating a culture that celebrates research and innovation.

The University of Rhode Island is behind—locally, nationally, and internationally—in both research investment and creating a culture that supports research leadership. Yet, the essential ingredients for improving the situation and strengthening URI's research capacity are readily identified. In releasing this report and recommendations, the Commission hopes to stimulate a statewide conversation about the challenges and opportunities Rhode Island faces in setting a bold new direction for URI.

"Universities that seek to rise in the ranks of the nation's elite research institutions need reliable measures of performance that will reflect their success in the competitive higher education marketplace."

— The Center for Measuring University Performance, "The Myth of #1: Indicators of Research University Performance"

II. Indicators of Public Research University Excellence

To discern URI's best path to an improved research enterprise and heightened University-led innovation, it is important to understand URI's current position relative to both peer institutions and benchmark institutions. (We evaluate two sets of benchmark institutions, discussed in greater detail below.) The data points used to develop a comparative picture are drawn from the comprehensive set of indicators developed by The Center for Measuring University Performance (The Center), together with indicators recommended by the Commissioners, university research experts, and URI faculty members and administrators.

HOW THE INDICATORS WERE CHOSEN

The core list of Key Indicators of Research Excellence was developed by The Center for the purpose of giving universities a set of criteria against which they can evaluate their performance relative to peers. The Center offers a detailed rationale for its choice of indicators in the report "The Myth of #1: Indicators of Research University Performance."[4] As the authors note, inconsistencies in how universities collect, analyze, and report data make it difficult to create a broader or more comprehensive set of indicators.

The Center's indicators have been adopted by research universities across the country. Broadly, these indicators encompass five categories:

1. Research Productivity;
2. Recognition of Faculty and Programs;
3. Graduate Education and Program Indicators;
4. Undergraduate Education and Program Indicators; and
5. Overall Financial Resources.

Each of The Center's indicators is used as a base of comparison in these pages, and each is briefly explained. We include several additional indicators within the five categories: Carnegie classifications/research ratings; ten-year trends in research funding; intellectual property creation and invention disclosures, patent applications, patents issued, current and historical licensing income; highly cited faculty; and doctoral programs.

BENCHMARK INSTITUTIONS

This report compares the University of Rhode Island to six other research universities:

- The University of Vermont (UVM) and the University of New Hampshire (UNH), identified by URI as academic peers;
- The University of Connecticut (UCONN), identified by URI as a "peer – aspire to be like";
- The University of Hawaii at Manoa (UH-M) and Arizona State University (ASU), chosen as "emerging" public research universities; and
- The University of Michigan (UMICH), selected as a "best in class" public research university.

[4] John V. Lombardi, Diane D. Craig, Elizabeth D. Capaldi and Denise S. Gater. 2000. The Myth of the #1: Indicators of Research University Performance. The Center for Measuring University Performance.

The University of Hawaii at Manoa and Arizona State University were chosen as emerging research universities based on input from interviews with experts in the field, with particular attention paid to both universities' exceptional growth in total and federal R&D expenditures in the ten-year period from 1996 to 2006.

The University of Vermont, the University of New Hampshire, and the University of Connecticut are among ten schools in URI's Info Bank (www.uri.edu/ir/uriinfobank/peers.html), a collection of data on enrollment, faculty, tuition and fees, finance, degrees conferred, out-of-state percentage, and selectivity, maintained by URI's Office of Institutional Research for general comparison purposes. These schools are classified as "peers – similar to URI" and "peers – aspire to be like" according to statistical similarities. UNH, UVM, and UCONN were selected for this report based on their research activity, size, and geographic proximity. *(See Table 1)*

The universities in our comparison set range in size and four have medical schools. Nevertheless, as The Center notes:

> …while issues of scope (land grant, mission, health and engineering programs, affiliated laboratories and hospitals, and professional schools) provide a context within which research universities function, they do not determine the success of the research university. Institutions of quite different scope and scale (student, faculty, budget size) appear at all levels among America's top research institutions.

UNIVERSITY COMPARISONS

1. Research Productivity

a. Growth in Federal Funding
b. Research & Development Expenditures
c. Carnegie Rating
d. Invention Disclosures
e. Patent Applications and Patents Issued
f. Licensing Income

a. Growth in Federal Funding

According to the National Science Foundation (NSF), federal R&D expenditures increased by 117 percent from 1996 to 2006. As shown in Table 2, URI's federal research funding grew by just 29 percent, while neighboring public research university peers more than doubled their federal research funding. By not keeping up with the overall growth in R&D, URI lost a great deal of its market share of research funding—even though much of the federal academic R&D funding awarded in this period supported research in fields in which URI has a solid foundation of expertise: medical/biological sciences and engineering. Had URI maintained the average growth of UNH and ASU, which also have no medical school, federal research funding at URI in 2006 would have been around $119 million—more than 2.5 times the $47 million actually obtained.

TABLE 1: ***Faculty, Undergraduate Students, and Graduate Students, 2006-2007***

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
Total faculty	**706**	767	948	1308	1272	1974	2748
Total undergraduate students	**11,875**	10,082	11,971	16,347	14,037	41,815	25,555
Total graduate & professional students	**3,187**	1,788	2,877	7,210	6,320	9,419	14,470
Total students	**15,062**	11,870	14,848	23,557	20,357	51,234	40,025

Source: Common Data Sets, 2006-2007

TABLE 2: *Federal Research Expenditures (in thousands)*

	1996	2006	CHANGE
All institutions	$13,810,064	$30,033,156	117%
URI	**$36,337**	**$46,898**	**29%**
UNH	$23,305	$86,416	271%
UVM	$31,521	$82,519	162%
UCONN	$53,009	$124,837	136%
UH - M	$40,198	$202,419	404%
ASU	$38,947	$109,893	182%
UMICH	$281,062	$565,739	101%

Source: National Science Foundation

Over the past 10-15 years, many research universities have attracted funding that has enabled them to improve existing research capacities: leveraging research growth to attract talented research faculty, building and renovating research facilities, and putting in place the necessary infrastructure to support research. Furthermore, a university's track record for receiving research dollars is an important factor in attracting more grants and contracts from both public and private sources.

URI must attempt to make up for lost time—but in the current economic environment, the budgets of federal grant-writing agencies are flattening, and current federal funding increases are failing to keep pace with inflation. The only way for URI to grow research capacity in a no-growth research environment is to be better than the competition, increasing market share by attracting funds away from competitor institutions, many of which currently have stronger foundations for competing for limited research funds.

b. Total Research & Development Expenditures

The Center looks at total as well as federal R&D expenditures. *(See Table 3)*

URI lags far behind all other schools in the comparison set. URI's R&D expenditures in 2006 totaled $70.7 million, or about 60 percent of the next lowest total R&D expenditures in the comparison set, UNH's. Federal R&D expenditures at URI were $46.9 million, or about 57 percent of the next lowest federal R&D expenditures in the comparison set, UVM's. Both UNH and UVM are winning significantly more dollars in grants and contracts.

TABLE 3: *Research & Development Expenditures, 2006*

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
Rank by total R&D expenditures	**145**	116	118	78	68	81	4
Total R&D expenditures	**$70.7m**	$121.8m	$115.1m	$215.2m	$249.6m	$202m	$800.5m
Federal research expenditures	**$46.9m**	$82.5m	$86.4m	$124.8m	$202.4m	$109.9m	$565.8m
Federal as % of total R&D expenditures	**66%**	68%	75%	58%	81%	54%	71%

Source: National Science Foundation

TABLE 4: *Carnegie Research Rating, 2005*

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
Carnegie Rating	**RU/H**	RU/H	RU/H	RU/VH	RU/VH	RU/VH	RU/VH

Source: Carnegie Foundation

c. Carnegie Rating

The Carnegie Foundation for the Advancement of Teaching places research universities that award more than 20 doctoral degrees yearly and receive NSF funding into three categories:

1. Research University/Very High Activity (RU/VH);
2. Research University/High Activity (RU/H); and
3. DGU (Doctorate Granting University).

The latest ratings (in 2005) are based on data collected in 2003 and 2004. URI received a rating of Research University/High Activity, as did the University of Vermont and the University of New Hampshire. The other universities in the peer group received a rating of Research University/Very High Activity. *(See Table 4)*

d. Invention Disclosures

Invention disclosures are the first step toward obtaining a patent; they represent research for which a patent application might later be submitted. In 2006, URI submitted 19 invention disclosures, significantly fewer than its peers UVM (43) and UNH (32). ASU, which like URI does not have a medical school, had 154 invention disclosures in 2006—eight times URI's number. *(See Table 5)*

e. Patent Applications and Patents Issued

URI submitted 24 patent applications in 2006, more than UVM (13) and UNH (9), and similar to UCONN (30). URI was issued 4 patents, similar to UNH (4) and UVM (2), but significantly behind UCONN's 26, ASU's 23 and UMICH's 79 patents issued. *(See Table 6)*

TABLE 5: *Invention Disclosures, 2001-2006*

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
2001	**11**	14	14	64	33	64	182
2002	**16**	14	25	75	34	97	237
2003	**16**	24	15	83	28	86	257
2004	**10**	34	19	70	56	94	285
2005	**26**	24	11	85	46	120	287
2006	**19**	43	32	67	64	154	288

Source: Association of University Technology Managers

TABLE 6: *Patent Applications & Patents Issued*

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
Patents issued *(1969–2005)*	**31**	57	19	177	112	109	777
Patent applications *(2006)*	**24**	13	9	30	37	49	137
Patents issued *(2006)*	**4**	2	4	26	1	23	79

Source: Association of University Technology Managers

f. Licensing Income

Although licensing income is an imperfect measure of research productivity, since it can be strongly dependent on a few major licenses and can therefore fluctuate significantly as patents expire, it does demonstrate to some degree the commercialization potential of research. Illustrating this fluctuation, URI's licensing income decreased from $900,000 in 2006 to $680,000 in 2007, with $250,000 in licensing income projected for 2008. *(See Table 7)*

The number of licenses and options executed on intellectual property also helps show the commercialization potential of research. Every institution in the comparison set far exceeds URI's 2006 licensing activity. *(See Table 8)*

We also considered including data on successful start-up companies emerging from university-based research; some universities include such assessments when measuring regional economic impact, such as the Library House's 2006 study of the "Impact of the University of Cambridge on the UK Economy and Society." Although successful start-ups are clearly indicative of an innovation- and commercialization-friendly university culture, inconsistencies in how universities collect, analyze, and report this data, as well as the variety of intellectual property policies found at different institutions, make this measure extremely difficult to quantify. Information on the number of licensing agreements between universities and start-up companies is collected by the Association of University Technology Managers, available online at www.autm.net.

TABLE 7: *Licensing Income*

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
2006	**$0.9m**	$0.016m	$0.186m	$0.814m	$0.9m	$3.35m	$20.439m
2002–2006	**$4.733m**	$0.688m	$0.603m	$5.487m	$3.339m	$9.922m	$63.699m
1996–2006	**$9.363m**	n/a	$0.794m	$8.537m	$5.294m	$16.297m	$89.068m

Source: National Science Foundation

TABLE 8: *Licenses and Options Executed, 2006*

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
2006	**1**	7	12	13	11	19	97

Source: Association of University Technology Managers

TABLE 9: U.S. News & World Report *Ranking of National Universities, 2008*

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
2008	Third tier	96	108	64	Third tier	124	25

Source: U.S. News & World Report

2. Recognition of Faculty and Programs

a. *U.S. News & World Report* College Rankings

b. Faculty Memberships in National Academies and Nationally Recognized Faculty Awards

c. Highly Cited Faculty

a. *U.S. News & World Report* College Rankings

Although no measure can adequately capture a college or university's academic quality, the rankings issued by *U.S. News & World Report* offer an approximate gauge, and are particularly significant because of their influence on recruitment (primarily at the undergraduate level, but also of graduate students and faculty). These rankings compare institutions of higher education to their peers as classified by the Carnegie Foundation for the Advancement of Teaching.

The University of Rhode Island is classified in the category of "National Universities," which includes 262 universities (164 public and 98 private). Rankings are based on the following indicators of academic quality: peer assessment, retention, faculty resources, student selectivity, financial resources, graduation rate performance, and alumni giving rate. The top 50 percent of universities are assigned numerical rankings; the following 25 percent are classified as "third tier" and the bottom 25 percent are classified as "fourth tier."

U.S. News ranks URI "third tier." The University of Hawaii at Manoa, a successfully emerging research university, is also identified as "third tier."

URI-chosen peers UVM and UNH are both ranked in the top 50 percent of national universities (ranked 96 and 108, respectively), as is ASU (124). UCONN, at number 64, is in the top quarter. *(See Table 9)*

b. Faculty Memberships in National Academies and Faculty Awards

While awards of grants and contracts exhibit a faculty's ability to bring in outside funding, additional measures are necessary to assess faculty research aptitude. To determine overall success and distinction of faculty work, The Center uses membership in the National Academies as well as the number of nationally recognized faculty awards in the sciences, social sciences, humanities, and health professions as indicators.

The National Academies comprise four individual organizations: the National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine, and the National Research Council. They advise the federal government on policy in science, engineering, and medicine. Election to membership in a National Academy is generally regarded as acknowledgement of high achievement in research. *(See Table 10)*

Two URI faculty members received nationally recognized awards in 2006. While this is comparable to the other New England schools, a substantially larger fraction of faculty members at the emerging and best-in-class institutions in the comparison set are receiving national recognition.

TABLE 10:

Faculty Membership in the National Academies and Nationally Recognized Faculty Awards, 2006

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
Faculty membership in National Academies	**2**	2	0	3	8	16	76
Ratio of faculty membership in National Academies to total faculty	**1 : 353**	1 : 570	n/a	1 : 436	1 : 159	1 : 123	1 : 61
Nationally recognized faculty awards	**2**	5	2	6	10	13	51
Ratio of nationally recognized faculty awards to total faculty	**1 : 353**	1 : 228	1:474	1 : 218	1 : 127	1 : 152	1 : 90

Source: The Center for Measuring University Performance

c. Highly Cited Faculty

URI faculty members suggested that publications and citations be included as a measure of faculty effectiveness. These are not used as indicators by The Center, perhaps because there is no single standard for collecting and quantifying faculty publications or citations. We therefore include citations from ISIhighlycited.com, a division of Thomson Scientific's ISI Web of Knowledge, which has tracked citations in 21 subject categories in scientific journals since 1981. Though an imperfect measure, tracking these citations helps to identify the most influential scientists in these categories worldwide (while also providing a way to follow the evolution of an idea).

In 2006, URI had eight faculty members listed as highly cited scientists, which represents 1 in 88 faculty members. Based on the ratio of highly cited faculty to total faculty, URI has a higher concentration of highly cited scientists than the other schools in the comparison set, with the exception of the University of Michigan, which has a ratio of 1:56 (excluding its medical school). *(See Table 11)*

TABLE 11: ***Highly Cited Faculty Members***

	ISI HIGHLY CITED FACULTY (THOMPSON SCIENTIFIC)	HIGHLY CITED FACULTY: TOTAL FACULTY RATIO
University of Michigan	53	1 : 56
University of Rhode Island	**8**	**1 : 88**
Arizona State University	11	1 : 179
University of Connecticut	5	1 : 262
University of Hawaii - Manoa	13	1 : 98
University of Vermont	2	1 : 570
University of New Hampshire	4	1 : 237

Source: ISIhighlycited.com

TABLE 12: *Doctoral Degrees, Doctoral Programs and Postdoctoral Appointments*

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
Doctoral degrees (2005)	**74**	59	63	261	156	314	725
Doctoral programs, estimated (2007)	**26**	20	23	64	52	63	140
Postdoctoral appointments (2004)	**41**	105	24	257	184	116	639

Sources: National Center for Education Statistics, individual institutions

3. Graduate Education and Program Indicators

a. Number of Doctoral Degrees Granted

b. Number of Doctoral Degree Granting Departments

c. Number of Postdoctoral Appointments

Because graduate students and postdoctoral appointees play a primary role in driving a university's research, The Center looks at the number of doctoral degrees granted each year as well as the number of postdoctoral appointments. The number of doctoral programs has been added to show each university's broader capacity to take on doctoral students. *(See Table 12)*

URI's 74 doctoral degrees awarded in 2005 is similar to UVM's 59 and UNH's 63. All other schools in the comparison set at least doubled this number. UCONN awarded 261 doctorates, while the University of Michigan awarded 725.

In 2004, URI made 41 postdoctoral appointments. With the exception of UNH (24), all other universities in the comparison set substantially exceeded this number. UVM appointed 105 post-docs, while others, such as UCONN (257), University of Hawaii at Manoa (187) and the University of Michigan (639), more than quadrupled this number. The large number of doctoral programs offered by UCONN, UH-M, ASU and UMICH helps these institutions attract and accommodate a larger number of doctoral students than URI, and provide more areas of research potential.

TABLE 13: ***SAT Scores and National Merit and Achievement Scholars, 2005–2006***

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
SAT score – critical reading, middle 50% of accepted students	**490–585**	530–630	500–600	530–630	480–580	480–600	580–690
SAT score – math, middle 50% of accepted students	**510–610**	540–640	510–620	560–660	510–610	490–620	630–730
SAT score – writing, projected range, middle 50% of accepted students	**560–650**	590–670	570–660	600–670	540–630	550–660	640–720
National Merit and Achievement Scholars in entering freshman class	**1**	5	2	3	0	154	73

Sources: National Merit Scholarship Corporation Annual Report, The Princeton Review

4. Undergraduate Education and Program Indicators

a. Average SAT Score for Entering Freshmen

b. Number of National Merit and Achievement Scholars

As The Center notes, thriving research universities have a strong undergraduate base, which indicates the educational quality of those schools and additionally provides a pool of potential future graduate students and researchers. The two most reliable indicators of a strong undergraduate pool, least open to outside influence or variables, are SAT scores and the number of National Merit and Achievement Scholars.

URI's overall SAT scores are comparable to the University of Hawaii at Manoa's and ASU's. They are, however, lower than those URI's regional counterparts—and far lower than those of the University of Michigan. *(See Table 13)*

According to the National Merit Scholarship Corporation annual report of 2006-2007, URI's entering freshman class had one National Merit or Achievement Scholar, compared to UNH's two Scholars and UCONN's three Scholars.

The University of Vermont had a total of 5 Scholars, all five of whom were sponsored by the university. ASU had 154 Scholars, 127 of whom were university-sponsored. (University-sponsored scholarships range between $500 and $2000 per academic year.)

The number of ASU scholars stands out in contrast to the mid-level range of SAT scores, primarily because ASU began aggressive recruitment of Merit Scholars to its Barrett Honors College in 1999. ASU now has one of the largest populations of Merit Scholars in the country.

5. Overall Financial Resources

a. Endowment Assets

b. Annual Giving

a. Endowment Assets

Endowment assets provide a stable source of income that is independent of funding from grants, industry, or government. A university's overall endowment assets offer a relatively comparable reflection of the financial resources available for day-to-day functions, including research.

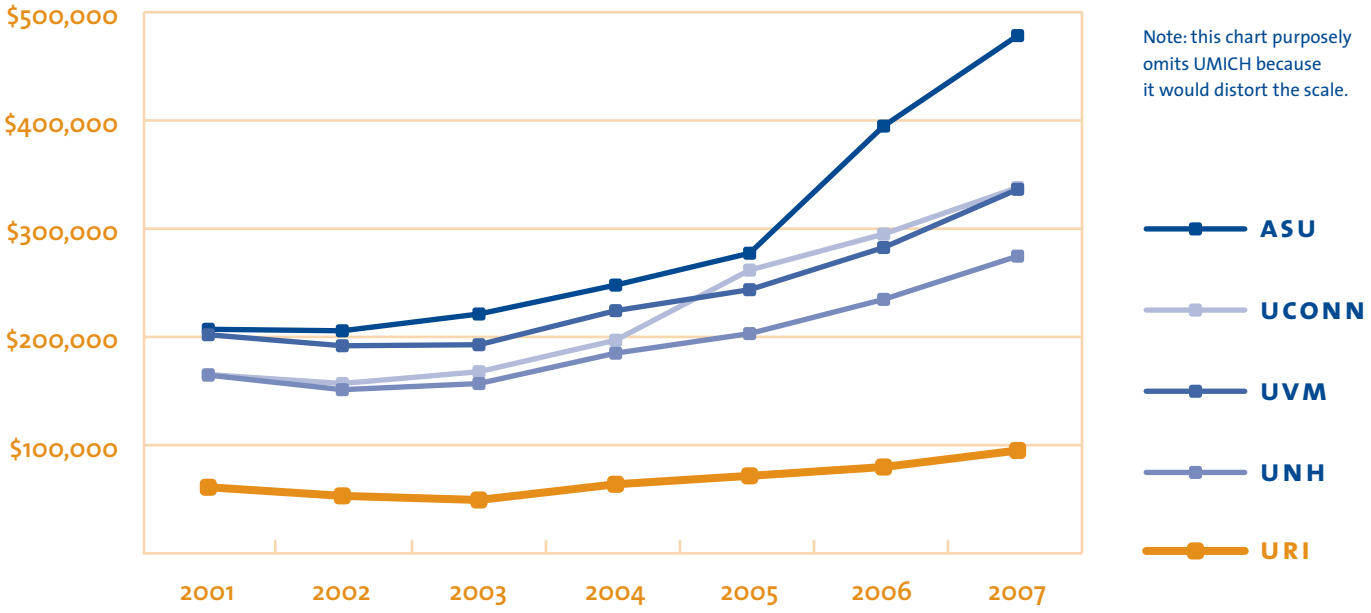
In 2007, URI's endowment assets were valued at $95 million, by far the lowest in the comparison set. Further, URI grew its endowment between 2001 and 2007 at a rate below its peers. This endowment is far too small: at the customary 5% annual draw rate it delivers under $5 million—less than 1 percent of URI's total budget. *(See Tables 14 & 15)*

TABLE 14: ***University Endowments (in thousands)***

	2001	2007	GROWTH
URI	**$61,118**	**$95,069**	**56%**
UNH	$164,729	$284,630	73%
UVM	$202,029	$336,363	66%
UCONN	$165,243	$337,945	105%
UH-M	$172,403	N/A	N/A
ASU	$207,062	$478,385	131%
UMICH	$3,614,100	$7,089,830	96%

Source: NACUBO Endowment Studies

TABLE 15: ***Endowment Growth, 2001–2007***



b. Annual Giving

Annual giving provides another measure of financial resources, demonstrating an institution's ability to raise funds, and reflecting support and interest from the broader community.

Though comparable to UNH, URI's 2007 annual giving lags far behind the other comparison universities—less than half of UVM's, less than a third of UCONN's, a quarter of UH-M's, only 12 percent of ASU's, and less than 5 percent of the University of Michigan's annual giving. *(See Table 16)*

URI AND INDICATORS OF RESEARCH EXCELLENCE: CONCLUSIONS

The comparative indicators paint a stark picture. On most measures URI lags far behind its own self-identified peers, and is even further behind the transforming and best-in-class universities. There are no groups of indicators that can show a perfect picture of where an institution stands relative to its peers. It is clear, however, that URI did not experience the research growth over the past decade that fueled new capacity at other universities. URI has far fewer endowment and annual giving resources to make new investments or to supplement its grants and contracts, and its total research profile sits well below the "to scale" figure of $100 million in annual research awards that serves as a benchmark for research competitiveness.

To elevate its position and emerge as a nationally competitive research institution, URI must make progress on virtually all fronts. Incremental changes will not be sufficient to drive this transformation. Rather, URI, its leadership, and state leadership must commit to making bold changes and creating the conditions necessary to significantly enhance research and innovation capacity at URI.

TABLE 16: Annual Giving, 2007

	URI	UVM	UNH	UCONN	UH-M	ASU	UMICH
2007	$12.6m	$28.7m	$12.6m	$40.6m	$49.3m	$104m	$293.4m

Source: Council for Aid to Education's Voluntary Support of Education

III. The Necessary Building Blocks: Preconditions For University Research Excellence

HOW THE PRECONDITIONS WERE CHOSEN

Thriving research universities perform well on quantitative indicators of research excellence and share a number of more qualitative characteristics as well. These necessary characteristics can be thought of as "preconditions" for research excellence. They are few in number, but so significant that there is strong consensus on what they are. They were identified from interviews with Commissioners and outside experts as well as from reports detailing the experiences of other universities and research organizations, and refined with input from the Commissioners and URI faculty members and administrators.

Preconditions for University Research Excellence

1. Leadership and Culture

a. Institutional leadership that integrates research as a key element of the institution's mission and strategic plan

b. Research as an integrated element of the institution's culture

2. Research Capacity

a. Dedicated resource streams that support research activity

b. Graduate programs and a graduate student support system for research activity

c. A strong, research-oriented faculty
   i. A faculty reward system that incentivizes research activity
   ii. A faculty recruitment system that prioritizes research expertise

d. Partnerships and collaborations – public and private, academic and corporate – specific to research activity

3. Modernization and Flexibility

a. Administrative and organizational structures that facilitate research

WHERE IS URI TODAY?

Administrators, deans, faculty members, and graduate students were asked to discuss and assess these preconditions for university research excellence as they apply to the University of Rhode Island. There is general consensus that, while most of the building blocks are present, URI needs to improve in all areas to create a solid foundation from which it can grow as a research university. This consensus is accompanied by a strong feeling that there is great potential for URI to become a top-tier research university.

As part of these discussions, URI faculty, deans, and graduate students were asked to rate each precondition at URI on the following scale:

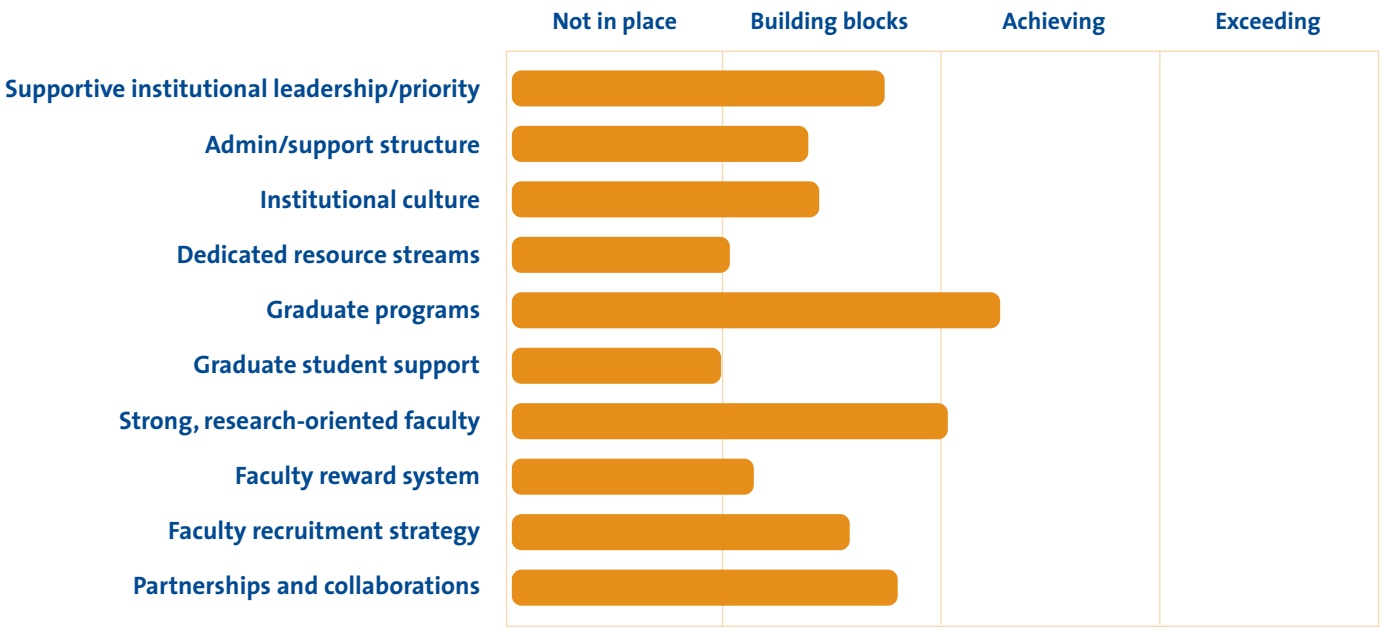
1: Not in place

2: Building blocks

3: Achieving

4: Exceeding

TABLE 17: Average Rating of Preconditions at URI (Deans, Faculty and Graduate Students)



1. Leadership and Culture

a. Institutional leadership that integrates research as a key element of the institution's mission and strategic plan

The leadership of any organization greatly influences that organization's focus and culture. As long-established, large institutions, universities require strong leadership at many levels for any initiative or change to be successful. At any university, but especially at public institutions of higher education, leadership extends beyond the campus to include not only those in administrative and academic positions, but governing bodies and statewide leadership as well. For a university to succeed, it is essential that the priorities of leadership at every level are aligned, particularly those of its president and its governing body. To fully realize its research potential, URI will need leadership at all levels committed to promoting and emphasizing the value of research as well as creating and sustaining policies and organizational structures that support and incentivize research excellence.

URI's leadership (both institutional and governing boards), culture, and support structures have not historically been oriented toward research growth and entrepreneurship. The need for leadership and higher top-down prioritization of research was emphasized strongly in most conversations at and about URI. Faculty, graduate students, and administrators are all aware of its paramount importance. Although pockets of research-focused leadership were identified at the College and departmental levels, and recent steps toward improving research capacity were recognized, almost all URI constituents expressed significant desire for the university's overall leadership and administration to place greater priority on research.

A Quick Look: Leadership at OSU

One of the underpinnings of Ohio State University's successful efforts to grow its research excellence has been an academic plan that includes an action initiative to:

> Become the catalyst of the development of Ohio's technology-based economy. Increase collaborations with the private sector to enhance research, successfully transfer University technology, and provide experiential learning and career opportunities for students.

Another vital part of Ohio State's success has been the vocal and visible championship of President William Kirwan, evident in speeches and writing as well as in his creation of the University Technology Partnerships Task Force—a body established to undertake a strategic planning process focused on building research capacity.

b. Research as an integrated element of the institution's culture

The strong research-oriented culture at competitive research universities stems from a widespread understanding of the value of research: all members of the university, from students, faculty and administration to funders and contributors, recognize the significance of research to education, economic development, and global impact. Research is understood by all constituents to be a fundamental part of the university's day-to-day activities and central to its mission.

In addition to its more direct benefits, a robust research enterprise fosters a focus on scholarship and academic excellence, the educational benefit of which cannot be underestimated. The intellectual environment and opportunities for student involvement created by a thriving research enterprise also produce graduates with critical thinking skills and creativity—two highly prized traits in today's knowledge economy.

Discussions at and about URI revealed that the University's historical positioning has created a pervasive culture that may not actively discourage entrepreneurship and innovation, but certainly does not encourage it. Those at URI who are not involved in research do not see research as fundamental to URI's activities and mission. This is particularly true for undergraduates, and the perception appears to be shared by the general public.

A Quick Look: A Culture of Accessibility at Purdue

Purdue University's website informs business and industry visitors that the Office of Industry Research and Technology Programs (OIRTP) provides a single point of contact for the private sector to access Purdue's broad range of research resources. One of OIRTP's outreach activities is a professional newsletter issued twice a year which goes to 2,000 industry research contacts nationwide. Businesses can also find research programs of potential interest by searching the Indiana Database for University Research Expertise through Purdue's website.

The accessibility of Purdue's contracting policies and procedures fosters industry partnerships. Working with the contract office, OIRTP created simple, standard project agreements including a menu of standard clauses that can be added or removed. For more complicated relationships with multiple partners or projects, arrangements are negotiated by staff from OIRTP and prepared by the contract office.

2. Research Capacity

a. Dedicated resource streams that support research activity

The Center for Measuring University Performance states the issue directly:

> The advantage in the competition [for research excellence] goes to those who have the money today to buy the services of talented people and the equipment and resources needed.

Research is an uncertain endeavor. Its financial rewards can be great, but they are rarely garnered in the short term. Research requires significant financial support for space, equipment, and personnel. Without up-front funding, projects will not get off the ground; without the security of dedicated funding, projects will not survive long enough to deliver a return on that investment.

URI is widely regarded as generally under-resourced and under-invested in ways that harm its research competitiveness. Mixed reports on faculty compensation indicate that URI is competitive at the start-up level (a valuable trait if youthful talent can be identified, attracted and retained) but not in the senior ranks. Graduate student stipends lag behind those at other schools with which URI competes. The infrastructure at URI is a major problem. A relative lack of modern facilities and available resources seriously hinders URI's ability to compete for junior level and mid-career research faculty, and attract grant funding and industry partners.

Through the Research Challenge Grant program, West Virginia invested $8.4 million in six research projects at West Virginia University and Marshall University. Leveraging an additional $20 million in external funding, those projects have turned into five start-up companies whose five-year projected revenues total $124 million.

b. Graduate programs and graduate student support system for research activity

Faculty research productivity and competition for grant funding are greatly aided by graduate students oriented toward research. Several schools and departments at URI (most notably Oceanography, Psychology, Pharmacy, Engineering, and Environmental and Life Sciences) offer strong and competitive graduate programs. Yet even the most competitive of these graduate programs have trouble attracting the best students because URI's tuition policies and stipend rates lag far behind national and regional levels and practices.

The most troublesome of these practices is URI's standing policy of not waiving tuition down to in-state levels for out-of-state graduate students engaged in research assistantships —a practice adopted by virtually every other state research university in New England. The potential benefits of changing this policy are addressed in the recommendations section.

c. A strong, research-oriented faculty

Faculty members are the essential engine of any university's research enterprise. Recruiting and retaining a strong, research-oriented faculty requires a reward system that encourages and reinforces research as central to organizational culture, incentivizes research pursuits, and attracts research-oriented faculty.

Administrators, faculty, and graduate students at URI believe there is enormous potential for research excellence, but it is blocked by financial, administrative, and cultural barriers. They identified a subculture or undercurrent at URI that is waiting to come above-ground, citing existing pockets of research and collaboration at URI that can serve as a foundation for growing research excellence and attracting new early- and mid-career research scientists.

i. A faculty reward system that incentivizes research activity

All strong research universities include research potential and productivity as criteria in recruiting faculty and evaluating faculty members for promotion and compensation. Research leaders must be attracted with packages that include adequate start-up funding, and those who demonstrate research productivity retained with rapid promotion. Technology transfer and intellectual property policies must provide incentives for moving research results and inventions into commercial application.

Successful research universities also know that simple recognition of research accomplishments, from the university level to the departmental, can go a long way toward fostering a research-friendly culture and faculty by reinforcing the importance of research.

While Rhode Island has begun, through its Science and Technology Advisory Council and Research Alliance, to create new grant opportunities, collaboration incentives, and recognition programs that benefit URI faculty, among others, few if any such incentives reportedly exist at URI itself.

ii. A faculty recruitment strategy that prioritizes research expertise

New faculty represent an opportunity to speed up the process of cultivating the research enterprise, because the presence of a few outstanding researchers helps attract other like-minded scholars. Well-known researchers in particular help attract individuals who are motivated to work with them, including graduate students, postdoctoral appointees, and other faculty, and their recruitment additionally communicates an institution's research prominence. There is as yet no system-wide commitment to such recruitment at URI. Instead, we find a financially-driven emphasis on teaching load.

- The University of Wisconsin-Madison includes technology transfer and commercialization in its guidelines for tenure review.
- Texas A&M University tenure review guidelines emphasize high-quality research.
- Ohio State University holds annual technology partnership awards at which the governor speaks.

d. Partnerships and collaborations—public and private, academic and corporate—specific to research activity

Collaboration helps to generate both ideas and resources. Its importance has never been greater than in today's global, knowledge-driven economy. Interdisciplinary efforts are widely recognized to advance innovation, not least by federal grant-writing agencies. Industry partners help to focus research efforts on areas where demand is great, and can supply necessary funding. Partnering with other universities allows researchers to leverage greater expertise than any one university can amass, and working in conjunction with other institutions across the state can help maximize both research results and economic development.

Significant barriers to collaboration of all kinds are reported at URI. Colleges, departments, and even individual labs are described as "siloed"—opportunities for collaboration on campus are missed for lack of university-wide communication of research activities. Bureaucratic policies and procedures turn even the simplest steps, like sharing space and equipment, into daunting tasks. Complicated pre- and post-award processes hinder collaborative grant-funded research both within URI and with other colleges and universities.

Industry outreach at URI is limited, and interested businesses have difficulty reaching potential partners within the university. Bureaucratic contracting processes pose frustrating, sometimes insurmountable, barriers to collaboration with the private sector.

Finally, underlying these problems, an institutional culture that largely ignores research prevents potential collaborators from considering or pursuing partnership opportunities with URI.

3. Modernization and Flexibility:

a. Administrative and organizational structures that facilitate research

Universities encourage research by facilitating the process of conducting and funding it at every level. Thriving research institutions have the flexibility and autonomy they need to make investments that build research capacity. Thriving research institutions also have implemented efficient, easy-to-use processes for researchers to find and use financial and other resources, to collaborate across departments and with the private sector, and most importantly, to succeed with their research.

These processes include assistance with grant-writing, industry outreach, efficient accounting procedures, and centralized administrative research functions. At many universities, dedicated research and technology transfer offices provide one-stop shopping for potential industry partners, matching their needs with faculty members' areas of expertise and informing researchers about grant opportunities, intellectual property issues, and entrepreneurial opportunities. Such institutions are constantly seeking to improve their organization structures to support growth.

In contrast, outmoded policies and procedures, antiquated and paper-based information flow, lack of autonomy combined with slow response at the institutional level, and severely limited administrative support all stymie research at URI by creating inefficiencies that slow faculty productivity and in some cases prevent innovation and collaboration from ever taking place. These problems have prevented URI from taking some of the leaps forward that have transformed other schools. Faculty and graduate students in particular noted that collaborations between Colleges and partners, vendors, and other institutions are hindered by organizational issues within the post-award process and with procurement processes, and general slow response time at the institutional level on things like hiring and travel. Faculty regard these hindrances as significant barriers to pursuing opportunities.

Although URI has made some progress in addressing these organizational and procedural issues, much still needs to be done to set URI on the path toward greater research competitiveness.

Recent Progress at URI

URI has made progress recently in becoming more-research friendly, including:

1. Creation of the Division of Research and Economic Development as a fifth division of the University (alongside Academic Affairs, Administration, Student Affairs, and University Advancement). Previously, Research was part of the Division of Academic Affairs.
2. Creation of an independent, non-profit Research Foundation to assist faculty and staff in commercializing their inventions and research and building stronger collaborations with industry.
3. Investments in research personnel:
   a. Elevation of the chief research officer from Vice Provost to Vice President
   b. Elevation of two positions to Assistant Vice President level to create an appropriate Division leadership team: AVP for Research Administration and AVP for Intellectual Property Management and Commercialization
4. Plans for a URI Research and Technology Park.
5. Revision of the facilities and administration (overhead) policy to allow the new Division of Research and Economic Development to receive independent funding.
6. Increase of the cap on limited value purchase orders from $500 to $5,000 (which required an act of the General Assembly).
7. Resolution of some conflict of interest policies involving faculty entrepreneurship.

CASE STUDIES: SUCCESSFUL RESEARCH PROJECTS AT URI

The University of Rhode Island is currently home to a number of pockets of existing research excellence which can serve as guideposts for future growth. The following project summaries highlight how investigators in these areas are creating a foundation for a thriving research environment.

Center of Excellence for Explosives Detection, Mitigation, and Response

Jimmie Oxley, PhD

The U.S. Department of Homeland Security (DHS) has selected the University of Rhode Island as one of two national co-leaders of a new Center of Excellence for Explosives Detection, Mitigation, and Response. Each institution will receive a grant of $2-4 million per year over a period of four to six years. The selection was part of an announcement of five new Centers of Excellence across the country, each consisting of teams of academic institutions that are leaders in their fields of study.

Professor of Chemistry Jimmie Oxley, an internationally renowned expert in explosives at the University of Rhode Island, said: "This grant from Homeland Security recognizes URI's leading research and outreach in explosives, energetic materials and pyrotechnics and its ability to partner with other institutions doing work in these areas. Our team is pleased to be chosen to further science and education in these fields." Oxley works with the Federal Bureau of Investigation, the Federal Aviation Administration, police agencies across the country, the United Kingdom and Israel on research related to explosives and terrorism, and she is often a first choice of the media when explosives are involved in terrorist attacks. She is frequently called upon to lend her expertise to high-profile national and international incidents.

URI scientists may hold key to cancer treatment

Yana K. Reshetnyak, PhD and Oleg A. Andreev, PhD

Yana Reshetnyak, an assistant professor of physics at the University of Rhode Island, may have discovered a way to stop the growth of cancer cells without harming the healthy cells that surround them. The Department of Defense granted Reshetnyak a three-year, $323,000 New Investigator Award to support her prostate cancer research. The URI scientist's approach is not restricted to the treatment of prostate cancer, and could provide a new concept for drugs and drug delivery in the treatment of a variety of cancers.

Reviewers of her proposal, mostly physicians, gave Reshetnyak high praise: "This proposal has a number of strengths. The concept being developed is outstanding in its novelty and innovation and potentially represents a new paradigm for cancer therapy."

Reshetnyak collaborates on this work with her husband, Oleg Andreev, and affiliates from Yale University. Andreev is also an assistant professor of physics at the University of Rhode Island. Their research was supported in part by grants from the National Institute of General Medical Sciences, the Department of Defense, the National Center for Research Resources, and a Research Development Grant from the Council for Research, University of Rhode Island.

The URI Institute for Immunology and Informatics (I^3)

Anne DeGroot, MD and Leonard Moise, PhD

The mission of the institute is to improve human and animal health by applying the power of immunomics (informatics, genomics, and immunology) to the design of better vaccines, diagnostics, and therapeutics. The institute supplies cutting-edge bioinformatics tools to accelerate the development of treatments and cures for immune-system related diseases. The I^3 also makes these tools available to the global community for the development of vaccines for tropical and emerging infectious diseases.

Anne De Groot is a URI Research Professor, Director of the Institute for Immunology and Informatics, and CEO and Chief Scientific Officer of EpiVax, Inc. She is a nationally recognized expert in epitope-driven vaccines and has been working on TB, HIV (AIDS), HPV (Cervical Cancer) and more recently, smallpox and tularemia vaccines. She has emphasized the development of vaccines that are globally relevant and affordable to the persons at greatest risk of disease. Leonard Moise is a URI Assistant Research Professor and Associate Director, I^3, and Director of Vaccine Research for EpiVax, Inc.

Cancer Prevention Research Center (CPRC)

James Prochaska, PhD

Since its inception in 1997, CPRC has brought in over $44 million in extramural funding. Its director, James Prochaska, has developed a model that has been used all over the world as a platform for promoting behavior change with a wide range of populations and an array of non-healthful behaviors. James Hahn, chair of the board of the American Cancer Society's New England Division, said: "I can think of no one else in the field of behavioral sciences who has made as great a contribution in understanding individual behavior, and who is more widely responsible for preventing the onset of cancer, than Dr. James Prochaska. His landmark Stages of Change Model is recognized around the world as among the best platforms for effectively promoting healthful behavioral change, such as smoking cessation. His work is saving lives from cancer every day."

Center of Excellence on Research on Offshore Renewable Energy (RORE) at the Graduate School of Oceanography

This new Center, which is closely aligned with the Rhode Island Office of Energy Resources, coordinates and expands research conducted at the Graduate School of Oceanography (GSO) and the Colleges of Environment and Life Sciences (CELS), Engineering (COE), and Arts and Sciences (CAS). The vision of this new Center is to advance R&D in the areas of offshore wind, current, wave, and thermal energy to position the State of Rhode Island as the national leader in ocean energy. Our current expertise includes leading wind and storm researchers; wind measurement experts; world-renowned modeling expertise in ocean/atmosphere, currents, and waves; a leading team of researchers in offshore oil and gas seafloor foundations; materials scientists; ocean engineers; marine policy experts; artificial reef specialists; and marine environmental protection specialists.

CASE STUDIES: SUCCESSFUL MODELS AT OTHER INSTITUTIONS

Nationally and internationally, universities increasingly recognize the critical impact a thriving research enterprise has on innovation and economic development and have initiated strategic plans to capitalize on this relationship. Following are two examples of how schools of higher education are working to enable and maintain transformative change in their states.

West Virginia: Investing in a Statewide Vision for Research

Leaders in the West Virginia Governor's office, along with the Executive Director of the state's Experimental Program to Stimulate Competitive Research (EPSCoR) initiative, recognized the need for their state to intensify its research enterprise in order to compete with neighboring states in a rapidly changing economy. Together they teamed with members of the state's two research universities, West Virginia University (WVU) and Marshall University (MU), the West Virginia Development Office and members of the business community to author "Vision 2015," a detailed strategic plan to grow West Virginia's research enterprise and spawn technology-based economic development.

West Virginia has embraced Vision 2015, which defines goals and accountability measures for each goal. The report serves as the state's overall research strategic plan and is used as a core reference in structuring formal proposals. It has also strengthened collaboration between WVU and MU.

The overall goal is for research and innovation to be the top driver of West Virginia's state economy, creating 33,000 new jobs and $3.3 billion in economic impact by 2015.

To support this goal, the West Virginia legislature gave WVU and MU $60 million for research infrastructure (personnel and facilities). Of this, $50 million has been used to establish the West Virginia Research Trust Fund "Bucks for Brains" Program, which matches private gifts for research made to WVU and MU.

Vision 2015 outlines specific targets, including:

- Double federal funding for research and development over every five-year period
- Build new 100,000-square-foot science and engineering facility at WVU and MU by 2010
- Create four research thrusts/clusters in emerging research areas by 2010
- Achieve 20 percent increase in science, technology, engineering, and mathematics (STEM) researchers at the state's research universities by 2008
- Rework policies for tenure, workload, and promotion to encourage research and innovation
- Increase the number of STEM doctorates by 10 percent each year
- Increase the racetrack video lottery proceeds which go to the Research Challenge Fund from the current 0.5 percent to 5 percent by 2015
- Create a workforce able to accommodate anticipated job growth in STEM fields by creating a curriculum to train STEM technicians at community and technical colleges

While it is too early to see the results of Vision 2015, an earlier initiative—the Research Challenge Grant Program—has yielded a significant return on the state's $8.4-million investment in six research projects at West Virginia University and Marshall University. These projects have attracted more than $20 million in external funding, initiated five start-up companies with a five-year revenue projection of $124 million, filed 10 patent applications, and received five patents. Two university research centers with industry partners have resulted from the program, one production facility is under development, and two of the start-up companies estimate that they will create 295 jobs in West Virginia over the next five years.

Arizona State University: An Environment for Collaboration

In 1994, Arizona State University (ASU) achieved a Research I designation from the Carnegie Foundation, placing it in a group of research universities awarding at least 50 doctorates per year and receiving more than $40 million annually in federal R&D funding. This Research I status elevated ASU to a new level of recognition, which has helped to attract world-class scientists and collaborators. Since 1994, ASU's research funding has increased by almost 400 percent.

ASU now strives to join the ranks of the elite research universities in the country and has made significant strides due to President Michael Crow's emphasis on research and the commitment of the state of Arizona. In 2000, Arizona voters approved a tax increase to support K-12 education and university research, and in 2003, the Arizona State Legislature passed the Research Infrastructure Bill, which has helped the university construct and acquire new research space.

The Biodesign Institute: "Designed for Collaboration, Built for Speed"

Designed to be an 800,000-square-foot interdisciplinary complex to house and connect bioscience, engineering, and computing, the currently 350,000-square-foot Institute was named 2006 Laboratory of the Year in an international competition conducted by *R&D Magazine*.

The Institute currently contains 10 research centers, including environmental biotechnology, infectious diseases and vaccinology, and applied nanobioscience. The new facility has aided the university in generating industry partnerships, and researchers at the Institute have been awarded millions of dollars from federal and private sources, including a grant from the Bill and Melinda Gates Foundation. Since 2004, researchers at the Biodesign Institute have received more than a dozen patents and several spin-off companies have been established.

The ASU-Army Flexible Display Center

This cooperation between the military, industry, and higher education is a five-year, $47.5-million project, with the option for an additional five years and $50 million. After a year-long selection process, the U.S. Army selected ASU, due in part to the university's ability to acquire a facility that could quickly be converted for the project.

According to ASU President Crow, "The FDC brings together academia, industry and government to develop what, in essence, will be revolutionary information portals—rugged and consume very little power. But they will be very powerful in that they will hold the key to successful military operations: real-time information." The technology will also be available for commercialization in health care monitors and consumer electronics.

Collaborators in this project include army partners (ARL and Natick Soldier Center), industry partners (EV Group, Honeywell, University Display, Kent Displays, Eink, Ito America, General Dynamics, Rockwell) and universities (Cornell University, University of Texas, Waterloo University).

IV. A Vision for Rhode Island: A Nationally Competitive Public Research University

The Commission believes that URI can and must become a nationally competitive public research university—to elevate the institution, benefit graduate and undergraduate education, create greater opportunities for students and faculty, and support the state's effort to grow a high-wage, innovation economy. To fulfill this vision, URI must aim for objectives that many other public research institutions have already prioritized: significantly expanding its research activity, increasing industry involvement in its research programs, and sending more graduates into the workforce with science, technology, engineering, and mathematical skills.

Meeting these objectives will involve addressing three fundamental issues: leadership and culture, modernization and flexibility, and building research capacity. The recommendations in this report are organized around these three important areas.

Leadership and culture means having visionary, experienced champions of research—within statewide governance, within institutional leadership, and at the School and College levels—to envision, fund, and guide this growth and transformation. The champions must also foster a collaborative, research-friendly institutional culture that encourages research and scholarship at every level. The search for the next president of URI offers a brass ring opportunity to usher in a research-focused era for URI, building on the strengthening in undergraduate education and campus culture that has been a major achievement of the last 15 years.

Modernization and flexibility means undertaking major changes to policies, practices and procedures that currently stymie rather than support research. It also entails developing a sustainable financial model for the university to support a stronger research-based institution. A new financial model for URI must reflect the reality of a declining percentage of its operating budget provided by a state appropriation, as well as the need for more flexibility in managing personnel costs and financing capital improvements. Achieving these aims will require developing new operating and financial models for the University.

Building research capacity for a research enterprise of competitive size and scale means adding significant numbers of new research faculty, attracting top researchers with financial and intellectual incentives, aggressively pursuing grant opportunities and private sector partnerships to raise the total levels of research funding, and raising non-tuition revenue to support the research enterprise. Building research capacity is particularly important in light of the growth achieved by competitive institutions in the past decade.

Specific measurable benchmarks for this transformation are:

- Achieve a "Research University/Very High Activity" designation from the Carnegie Foundation by 2015.
- Double total levels of research and development funding in the next five years, achieving total research funding of $140 million annually by 2015.
- Achieve measurable economic impact in Rhode Island through the development of a technology-oriented workforce, technology transfer, and greater collaboration with industry.

V. Recommendations to Achieve Research Excellence

PRIORITY RECOMMENDATIONS

The Commission's recommendations are aimed at achieving the vision outlined in the previous chapter. We are mindful of URI's starting point and of the increasingly competitive national and global research environment. Although the recommendations are distinct in their importance to URI's future success, they are also interdependent.

Universities that have experienced transformative change in stature and culture have done so under the guidance and direction of bold, visionary leaders. Yet even the strongest and most strategic leaders can be hamstrung by the lack of resources to build capacity; thus, unless URI modernizes many of its administration functions and achieves greater operating flexibility, it will remain a challenge to attract top-notch researchers. Those who do come are likely to leave for more entrepreneurial and supportive environments.

The Commission's three priority recommendations are:

1. **Attract a new President with demonstrated experience in building university-based research capacity, and who is capable of leading a transformative change effort at URI.**
2. **Create a sustainable financial model for URI that provides university leadership and the Board of Governors with the flexibility to make necessary investments in building research capacity that will make URI a stronger research-based university.**
3. **Jump-start URI's research capacity with a $100-million public investment through a bond initiative to capitalize the attraction of 20-30 world class research faculty, and to provide state matching funds to catalyze federal research grant procurement efforts.**

SPECIFIC RECOMMENDATIONS

Leadership and Culture

URI must be buttressed by visionary, experienced champions of research to envision, fund, and guide the growth and development of its research enterprise. From the top down and bottom up, URI must cultivate and develop a research-oriented culture: a widespread understanding of the value of research, an entrepreneurial spirit, and a culture of collaboration. The priorities of URI's leadership, governing body and state leadership must be aligned in support of this goal.

Recommendations

1. Make research and development a high priority in the recruitment and hiring of senior leadership at URI, beginning with the search for URI's next president.
   - The presidential search committee must identify, recruit, and hire a candidate familiar with university research and research enterprise, experienced in creating transformative change, and committed to the possibilities for URI as articulated in this report. The search committee should use this report during the search process. In support of this objective, Saul Kaplan, a member of this Commission, has been appointed to the presidential search committee.
     - Candidates for the presidency should have a track record of guiding institutional growth and transformation; should have a depth of understanding about scientific research, either through administrative positions or their own scholarship; and should be familiar with the unique culture of higher education.
   - Research expertise and commitment should be emphasized in all high level searches as well as for new hires and replacements for retiring faculty.
2. Ensure that URI's governing body supports, understands, and advocates for URI's unique mission as the state's public research university.
   - The Commission's research found that URI's governance model, wherein URI shares its sole leadership body with all of Rhode Island's other state-run universities and colleges, is highly unusual. Leadership of that body must strive to understand the unique needs and objectives of a strong research university particularly as they relate to needs and requirements at other state schools. To move forward in building URI's research capacity, state leadership must achieve strong alignment with campus leadership toward the objectives outlined in this report.
3. Make research a visible priority at URI.
   - Engage leaders in state government, on the board, among alumni, and on campus as vocal champions of the importance of research.
   - Undertake a robust government relations and communications effort to tell the URI/economic development story.
   - Publicize research activities underway at URI, both on campus and beyond.
   - Advertise research opportunities for students, both graduate and undergraduate.
   - Prioritize research funding (for lab space, research faculty) in URI's next capital campaign.
4. Encourage a culture of entrepreneurship and collaboration.
   - Remove existing barriers to campus-based collaboration; create mechanisms for collaboration on campus.
     - Increase support for proposal development and post-award processes between departments and Colleges.
     - Improve facilities management.
   - Strengthen tech-transfer support and industry outreach.
   - Position URI as the lead in collaborations with other institutions.
   - Foster and create greater research collaborations with Brown University and its medical school.

Modernization and Flexibility

URI needs a new financial model that gives the President and Board of Governors the autonomy to make strategic decisions about the university's key cost and revenue drivers. Although the State contribution as a total percentage of URI's operating budget has declined steadily over the years, legislative approval is still required to change the university's hiring cap and to borrow for capital improvements—regardless of URI's ability to self-finance the debt through its own revenue streams. *(See Table 18)*

In this current model URI can increase the number of students it enrolls, but cannot use the additional tuition revenue to hire new faculty or borrow to build a new dorm without legislative approval. Under this model it would be difficult, if not impossible, for URI to make the investments in new faculty and research infrastructure needed to significantly elevate URI's position as a nationally competitive research institution.

A culture of entrepreneurship and innovation cannot thrive in a culture of excess regulation, paper-based processes, and state-mandated procurement practices. The Commission has been told that research at URI is hamstrung by poor practices and systems: state hiring rules, state travel restrictions, cumbersome procurement practices, and limited information to aid grant administration. All this makes the post-award process at URI cumbersome and frustrating, and negatively influences the advancement of research. URI must improve these processes to support increased research activity.

Recommendations

1. Create a sustainable financial model for URI that provides university leadership and the Board of Governors with the flexibility to make investments in building research capacity that will make URI a stronger research-based university.
   - Allow the University to keep, manage, and invest institutionally-generated funds.
   - Remove the requirement of General Assembly approval for university borrowing (referred to as a Kushner Resolution) and vest the Board of Governors for Higher Education with this authority.
   - Remove the current FTE cap approval process and consider a structure in which URI employees are not state employees.
   - Cultivate state government's understanding of URI's priorities in order to secure predictable state funding levels.
   - Consider aligning the state's annual contribution to URI with the public policy objective of subsidizing in-state student access to URI.
   - Treat debt service for general obligation bonds to support new infrastructure at URI separately from annual appropriation to support operating costs.

2. Create greater fiscal flexibility.
   - Create incentives through a state funding formula that encourages the generation of non-tuition revenue and research grants at URI.
   - Support legislation currently before the General Assembly that would give $1 million in purchasing authority to URI.
   - Use faculty and research staff compensation decisions to create opportunities for hiring and retaining excellent researchers.

TABLE 18: *University of Rhode Island History of General Revenue Funding, FY 1994–2009*

	GENERAL REVENUE	GENERAL REVENUE AS A % OF TOTAL UNRESTRICTED BUDGET	GENERAL REVENUE AS A % OF TOTAL BUDGET
1994	$62,879,550	42%	27%
1995	$62,915,006	43%	28%
1996	$63,788,730	43%	24%
1997	$71,325,328	45%	25%
1998	$73,697,706	46%	26%
1999	$78,308,920	46%	26%
2000	$73,517,215	43%	23%
2001	$78,620,837	43%	23%
2002	$82,243,483	43%	23%
2003	$81,989,847	41%	21%
2004	$82,489,519	38%	21%
2005	$81,866,451	35%	20%
2006	$84,303,400	34%	18%
2007	$83,333,055	31%	17%
2008	$74,896,525	26%	14%
2009	$63,638,900	20%	11%

Source: Rhode Island Board of Governors for Higher Education

Research Capacity

Research excellence begins with research-focused faculty, good graduate students, modern facilities, and support structures that help faculty apply for, administer, and renew grants. Maximizing the value of campus-based research requires strong research administration and effective technology transfer support.

Recommendations

1. Jump-start URI's research capacity with a $100-million public investment through a bond initiative to capitalize the attraction of 20-30 world class research faculty and to provide state matching funds to catalyze federal research grant procurement efforts.

- Create a nationally competitive, state-financed "eminent scholars" program.
- Build programs to attract and retain top research faculty who are the drivers of research enterprise, through structures that ensure competitiveness and accountability.
- Make necessary improvements to research infrastructure, in both facilities and staff.
- Work with state leadership to put in place a leadership structure that can effectively manage this investment and ensure that funds are deployed in a manner that maximizes this catalytic investment.

2. Create and commit the necessary financial resources to research activities.

- Prioritize research investments in the use of discretionary funds.
- Increase outreach to industry.
  - Increase outreach from the Division of Research and Economic Development to industry; cultivate potential corporate partners.
  - Create mechanisms to share University-based research with the commercial world.
  - Invest in a research park on or near campus.

3. Support and reward URI faculty researchers.

- Create faculty incentives and rewards for research and innovation.
  - Base faster promotion and higher compensation on research productivity and quality.
  - Establish presidential-level awards for research innovation.
- Increase grant writing and post-award support, with emphasis on collaboration.
  - Provide a dedicated staff person as needed for each College to support proposal development, grant submission, procurement and post-award process, industry contacts, intellectual property issues.
  - Increase support for proposal development and post-award processes between departments and Colleges.
- Increase tech transfer and intellectual property support to incentivize commercialization of research and reward faculty entrepreneurship.
- Ensure that intellectual property policies remain competitive.

- West Virginia estimates that a 20 percent increase in faculty researchers at West Virginia University would cost $35 million and generate a 70 percent increase in research grants and contracts by 2015.
- Massachusetts's 2008 Life Sciences Bill commits $10 billion over 10 years, including $195 million to build research facilities on three University of Massachusetts campuses.

4. Attract and support student researchers.

- Make changes to the postdoctoral appointee system.
  - Eliminate state employee designation.
  - Align post-doctorate salary and benefits mandate to NIH and NSF recommendation levels.
- Increase support for graduate students.
  - Increase stipends for research assistantships.
  - Waive tuition to in-state levels (or below) for graduate students doing research.
  - Increase recruitment efforts—particularly at research and society meetings.
  - Increase the number of research assistantships.
  - Grant summer tuition remission for graduate assistants.
- Increase undergraduate involvement in research.
  - Publicize research opportunities for undergraduates.

5. Prioritize areas of established and emerging excellence when deploying resources.

- Prioritize research areas at URI in which excellence is established or emerging and which promise valuable economic benefits (e.g. ocean and marine science, biotechnology, green energy).
- Prioritize efforts aligned with Rhode Island's economic development potential.
  - Establish a "URI research footprint" in Providence to embed URI in Rhode Island's emerging center for academic and hospital research.
  - Increase internship opportunities, especially in science and technology.
  - Increase science and technology course offerings in continuing education.

INCREMENTAL SUGGESTIONS TO IMPROVE URI'S ADMINISTRATIVE PROCESSES AND EFFICIENCY

Research for this report shows that there are many incremental opportunities that URI could begin addressing immediately to boost productivity and, even more importantly, send a signal to research faculty and graduate students that URI is committed to self-improvement in support of the research enterprise. The state travel contract, the "multiple sign-off" system for everything from expense approvals to hiring, and the continued reliance on paper-based processes are particular examples. URI also needs to increase the ease of grants administration, particularly post-award, and implement more transparent and user-friendly financial accounting systems.

VI. Next Steps: Building on Momentum to Make URI a Nationally Competitive Public Research University

The Rhode Island Science and Technology Advisory Council (STAC) encouraged the creation of the URI Commission for Research and Innovation because its leadership believes that URI can and must become a nationally competitive public research university. This change in course is necessary to secure the future success of URI, support graduate and undergraduate education, and, above all, support the state's effort to grow a high-wage, innovation economy.

The work to fulfill this ambitious vision for URI has just begun. Success will require deep and long-term commitments from every level of state and university leadership. Bringing the recommendations in this report to fruition will require an unprecedented degree of cooperation and collaboration across branches of government and across the state's higher education leadership. Support for these recommendations must also be cultivated at URI and among the general public in order to accelerate a change in culture wherein URI's full potential as a driver of economic growth is fully appreciated.

To sustain the effort necessary to bring the Commission's recommendations forward, STAC is partnering with the Rhode Island Board of Governors for Higher Education and will establish an implementation committee. Members of this committee, including URI Commission for Research and Innovation Chairman Bob Flanders and Commissioner for Higher Education Jack Warner, will work to further develop and advance the recommendations of this report. The committee will work closely with state leaders, URI leadership and URI faculty to ensure the necessary commitment to making URI a nationally competitive research institution.

In addition, STAC will oversee a series of meetings and conversations with vested stakeholders to discuss this report and the Council's recommendations.

Comments about the report and feedback can be addressed to **uriideas@riedc.com**.

VII. Appendices

A. BACKGROUND: THE COMMISSION AND ITS CHARGE

Mission

To propose specific actions to strengthen the position of URI as a nationally competitive public research university and a key institution in Rhode Island's effort to strengthen its innovation economy.

Commissioner Biographies

Hon. Robert G. Flanders Jr., Chair

Robert Flanders served eight years as an Associate Justice of the Rhode Island Supreme Court before returning to the private practice of law in 2004. Today, he is a partner in the law firm of Hinckley, Allen & Snyder, LLP. He serves as an Adjunct Professor of Public Policy at Brown University, where he teaches constitutional law, and as an Adjunct Professor of Law at Roger Williams University, where he teaches courses on the judicial process. Judge Flanders is a graduate of Harvard Law School and Brown University. He serves as a member of various boards of directors and commissions, including the Rhode Island Board of Regents for Elementary and Secondary Education (Chair), the Care New England Hospital system, Women and Infants Hospital (Vice Chair of the Board), the Providence Performing Arts Center, Veterans Memorial Auditorium, the Rhode Island Historical Society, Common Cause of Rhode Island, the Brown University Leadership Advisory Council, and the Greater Providence YMCA, where he served as Chairman of the Board for a three-year term that ended on May 29, 2003.

Dr. Peter Alfonso

Peter Alfonso is the Vice President for Research and Economic Development at the University of Rhode Island. In previous research administration positions, he served as the Vice President for Research at the University of North Dakota, Associate Vice President for Research at the University of Tennessee, and Associate Provost for Research, University of North Carolina at Greensboro. From 1991 to 1999, Dr. Alfonso was a professor and head of the department of Speech and Hearing Science at the University of Illinois at Urbana-Champaign and from 1977 to 1991 served as research scientist at the Haskins Laboratories in New Haven, Connecticut, and as assistant professor, associate professor, and professor of Speech-Language Pathology and Audiology at the University of Connecticut. He has held a number of adjunct research and academic appointments in the United States and abroad. Since taking his Ph.D. in Speech Science and Experimental Phonetics from Purdue University in 1977, he has been awarded more than $20 million in federal research awards, and has published more than 130 book chapters, articles and abstracts in speech acoustics, perception, and speech physiology, particularly in the areas of speech motor control in normal and speech-disordered populations. Dr. Alfonso is a 1990 Fulbright Research Scholar to the Netherlands, a Fellow of the American Speech-Language-Hearing Association, and a Fellow of the American Council on Education.

Lord Alec Broers

Alec Broers has a long record of distinguished service. He is a well known and respected scientist and research administrator in the United Kingdom who has a summer home in Jamestown. Among a long list of prestigious positions, he spent nearly 20 years in research at IBM and has served as the head of the engineering department at Cambridge University in England and as Vice-Chancellor (or President) of that university. Recently, he served as President of the Royal Academy of Engineering (2001-2006) and delivered the prestigious BBC Reith Lectures. He is now retired, but his ongoing activities include chairing the science and technology committee of the British House of Lords. He is a pioneer in the area of nanotechnology and was knighted and made a life Peer by Her Majesty the Queen in recognition of his contribution to engineering and higher education.

Dr. James S. Coleman

James Coleman is Vice Provost for Research at Rice University. He has served in various academic research positions including Vice Chancellor for Research and Professor of Biological Sciences at the University of Missouri - Columbia (MU), and Vice President for Research and Business Development at the Desert Research Institute (DRI)—an environmental science research institute with annual research expenditures of approximately $30,000,000 and campuses in both Reno and Las Vegas, Nevada. He was previously an Assistant and Associate Professor of Biology at Syracuse University and a Program Officer at the National Science Foundation (NSF). Dr. Coleman's other key professional activities include serving as a member of the boards of the Missouri Innovation Center, the Association of Ecosystem Research Centers, the Research Alliance of Missouri, the Nevada Technology Council, and the Coalition of EPSCoR states. Dr. Coleman holds a B.S. in Forestry from the University of Maine, and a M.S., M.Phil and Ph.D. in physiological ecology from Yale University.

Carol Grant

Carol Grant is an executive whose experience has ranged through law, telecommunications and manufacturing for more than 20 years and has included executive positions at Verizon and Textron. Prior to her corporate experience, she was a litigation attorney for five years in two major law firms in St. Paul, Minnesota and Boston. Most recently Grant served as Chief of Operations for Providence Mayor David Cicilline. In that role, she led the departments that provide basic city services, planning and economic development. Grant has served as Chair of the Board of the National Conference for Community and Justice, member of the Governor's Economic Policy Council, Chair of the Board of Directors of the Greater Providence Chamber of Commerce, and on the boards of the Rhode Island Foundation, Providence Plan, Providence College, Providence Performing Arts Center, and AAA of Southern New England. As the first chair of the Rhode Island Airport Corporation, she was responsible for the oversight of the transformation of Rhode Island's airport system. Grant is a graduate of the University of Missouri and University of Michigan Law School.

Dr. David Hibbitt

Dr. David Hibbitt, Chairman of Hibbitt, Karlsson & Sorensen in Providence, began his career in engineering with Associated Electrical Industries of Manchester, England, working on the design of large steam turbines for electrical power generation. From 1972 to 1977 he worked for the Marc Analysis Research Corporation, where he was responsible for the development of the Marc finite element program. In 1978 he founded Hibbitt, Karlsson and Sorensen (now ABAQUS), and began the design and development of the ABAQUS program. In 1978 and 1980, Dr. Hibbitt taught as an adjunct professor in the graduate school of the University of Texas at Austin. He has served on the editorial advisory board of the International Journal for Numerical Methods in Engineering, and was a member of the Computational Mechanics Committee of the U.S. National Research Council's Commission on Engineering and Technical Systems from 1982 to 1984. He received a Brown University Engineering Alumni Medal in 1997. Hibbitt has served on advisory committees that assisted the Office of Naval Research and Sandia National Laboratory in evaluating their research programs in engineering mechanics; he currently serves on the executive council of the U.S. Association for Computational Mechanics, the North American advisory committee for NAFEMS (an organization that promotes reliability and quality in computational mechanics applications), and the advisory council for Brown University's Division of Engineering.

Constance Howes, Esq., FACHE

Constance Howes is President and Chief Executive Officer of Women & Infants Hospital, one of the nation's leading specialty hospitals for women and newborns. Prior to this she served as its Executive Vice President and Chief Operating Officer and was Vice President and General Counsel for Care New England Health System, the health system that comprises Women & Infants Hospital, Kent Hospital, and Butler Hospital. Before her appointment with Care New England, she was Vice President and General Counsel for Women & Infants Hospital. Ms. Howes was previously an attorney with Tillinghast, Collins & Graham for 17 years, where she practiced primarily in the area of business law and served as Chairman of the Corporate Department. Ms. Howes is a member of the Board of Trustees of the Greater Providence Chamber of Commerce and the Providence Economic Development Partnership; a member of Providence College President's Council and the Rhode Island Commodores; a past member of the American Hospital Association Regional Policy Board 1; and a member and past Chair of the American Hospital Association Maternal Child Health Governing Council. She is active with CWISH, the Council of Women and Infants Specialty Hospitals. She graduated *magna cum laude* from Kenyon College and received her J.D. degree from the University of Virginia School of Law.

Saul Kaplan

Saul Kaplan is the Executive Director of the Rhode Island Economic Development Corporation. He serves as the Executive Counselor to the Governor on Economic Growth and Community Development, and is the Chairman of the Board of Directors for the Quonset Development Corporation and the Slater Technology Fund. He is also a member of the Board of Directors of Family Services of Rhode Island and the Big Picture Company. Kaplan created and leads Rhode Island's unique Innovation @ Scale economic development strategy aimed at increasing the state's capacity to grow and support an innovation economy, including an effort to turn the state's compact geography and close-knit public and private networks into a competitive advantage. He was appointed by Governor Carcieri to the Rhode Island Science and Technology Advisory Council. As founder and Chief Catalyst of the Business Innovation Factory (BIF), a non-profit established in 2004 to promote collaborative innovation, Kaplan directs BIF's mission to bring public and private sector partners together to explore and test better ways to deliver value. He oversees BIF's portfolio of collaborative innovation projects—projects with transformational potential in areas including healthcare, security, education, ubiquitous computing, and customer experience innovation. Prior to his state leadership role in economic development Kaplan served as a Senior Strategy Partner in Accenture's Health and Life Science practice and worked broadly throughout the pharmaceutical, medical products, and biotechnology industry. Before beginning his career in management consulting, Kaplan spent eight years working for the Pharmaceutical Division of Eli Lilly and Company. As a Marketing Plans Manager, Kaplan was responsible for developing the launch strategy and successful introduction of Prozac into the U.S. market. He holds an M.B.A. from Rensselaer Polytechnic Institute focusing on the strategic management of technology and a B.S. in Pharmacy from the University of Rhode Island.

Dr. Margaret Leinen

Margaret S. Leinen is Chief Science Officer for Climos, a San Francisco-based company that leverages natural processes to reduce greenhouse gasses. Before joining Climos, she served six years as Assistant Director for Geosciences at the National Science Foundation, and was previously Dean of the Graduate School of Oceanography and Vice Provost for Marine and Environmental Programs at the University of Rhode Island. She was also Acting Dean of the College of the Environment and Life Sciences. Dr. Leinen is past president of the Oceanography Society and has served on the Board of Governors of the Joint Oceanographic Institutions, the Board of Directors of the Bermuda Biological Station for Research, and the Ocean Research Advisory Council. She also served as the Vice Chair of the International Geosphere-Biosphere Programme and on the Board on Global Change of the National Research Council/National Academy of Sciences. Dr. Leinen received her B.S. degree (1969) in geology from the University of Illinois; her M.S. (1975) in geological oceanography from Oregon State University; and her Ph.D. (1980) in geological oceanography from the University of Rhode Island.

B. COMMISSION RESEARCH SCOPE

The process of drafting this report began with guidance and input from the Commissioners, from the University of Rhode Island, from the Rhode Island Economic Development Corporation, and from publications and reports by a number of organizations including the Center for Measuring University Performance ('The Center'), the Association of University Technology Managers, the National Science Foundation, the National Governors Association, and the American Association for the Advancement of Science (AAAS). The early stages of the process also benefited from expert perspectives on building university research capacity from Edward G. Derrick, director of AAAS's Research Competitiveness Program; Paul L. Hill, vice chancellor for science and research at the West Virginia Higher Education Policy Commission and executive director of the West Virginia Experimental Program to Stimulate Competitive Research; and Sally Mason, president of the University of Iowa and former provost of Purdue University.

From these sources we began to build a list of quantitative indicators of research excellence and qualitative characteristics of successful public research universities. Guidance from the Commissioners, from faculty and administrators at URI, from external publications, and from URI's Office of Institutional Research helped us identify comparison schools. We assembled quantitative comparison data and expanded our understanding of research excellence using sources suggested by The Center, including the National Science Foundation and the Association of University Technology Managers, and continued with the help of the universities themselves as well as other research organizations including the Carnegie Foundation for the Advancement of Teaching, the National Association of College and University Business Officers, the Princeton Review, the National Merit Scholarship Corporation, *U.S. News & World Report*, the Council for Aid to Education, Thompson Scientific/ISI Citations, and the Integrated Postsecondary Education Data System.

To assess URI's position relative to the qualitative characteristics we identified, we met with URI's faculty and faculty senate, graduate assistants, deans, and administrators, including President Carothers, as well as the Rhode Island Board of Governors of Higher Education.

We also continued to explore what other institutions had done to grow research capacity, referring to many of the sources listed above as well as the *Chronicle of Higher Education*, the report "Innovation U.: New University Roles in a Knowledge Economy," and news articles, as well as conversations with and publications from the University of Rhode Island, the comparison institutions, and other universities.

All of this information, as well as an understanding of Rhode Island's particular research and economic environment, informed the Commission's report and recommendations.

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C. UNIVERSITY RESEARCH AND ECONOMIC DEVELOPMENT

For more on the link between university research and economic development, see the following reports.

Bank Boston. 1997. MIT: The Impact of Innovation.

> "… these findings extend our understanding of how MIT has been instrumental in generating new businesses nationwide. MIT is not the only university that has had a national impact of this kind, but because of its historical and continuing importance, it illustrates the contribution of research universities to the evolving national economy."

Innovation Associates. 2005. Accelerating Economic Development Through University Technology Transfer.

> "In 2004, the Connecticut Technology Transfer and Commercialization Advisory Board of the Governor's Competitiveness Council contracted Innovation Associates Inc. (IA) to examine exemplary technology transfer practices and to provide recommendations for enhancing state initiatives that leverage its university R&D resources. IA examined practices at 10 universities.… In addition to examining university technology transfer and commercialization activities, IA also examined related university and/or community entrepreneurship programs, incubators, research parks, seed capital programs, and cluster-driven innovation centers."

National Association of State Universities and Land-Grant Colleges. 2001. Shaping the Future: The Economic Impact of Public Universities.

> "Both sections of this report are based on information supplied by [96 NASULGC member institutions and 10 university systems] in response to a questionnaire sent out in the summer of 2000. …Data clearly indicate that state-supported institutions of higher education remain powerful engines for economic stability and growth. The average return on every $1 of state money invested in a NASULGC institution is $5."

National Governors Association Center for Best Practices and the Pew Center on the States. 2007. Innovation America: Investing in Innovation.

> "In an effort to establish some clear, replicable guidelines for investing in innovation, the Pew Center on the States in collaboration with the National Governors Association has created a set of guidelines for governors to help them leverage their investments, bridge the essential relationships between universities and the private sector, build an environment hospitable to innovation and more. The guidelines that follow are based on solid research, but more importantly, they are grounded in the real-world experiences of the states. Practices that have worked well in one state are certainly worth considering in others."

Robert Premus, Nada Sanders and Ravi K. Jain. 2003. Role of the University in Regional Economic Development: the US Experience. *International Journal of Technology Transfer and Commercialisation* 2(4): 369-383.

> "This paper examines evidence that universities contribute to regional economic growth by emphasizing strong science research, contributing to human capital investments, and by making the ideas freely available to society. Regions grow when they have the infrastructure and skilled people to absorb the new ideas and turn them into commercial products. University technology transfer initiatives can aid the dissemination and absorption of new knowledge, and thus contribute to economic development."

Louis Tournatzky, Paul Waugaman, and Denis Gray. 2002. Innovation U.: New University Roles in a Knowledge Economy. Southern Growth Policies Board.

> "This publication lays out a series of case studies as to how America's best universities in business-higher education partnerships have undertaken these tasks and identifies the multiple ways these partnerships continue to unfold. The universities selected through a nomination process are among those that systematically understand and are comprehensively addressing their role in regional economic development, not piecemeal with one or another exceptional program, but in a myriad of functions and roles."

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ADVISORY COUNCIL

The URI Commission on Research & Innovation was initiated as a recommendation of the Rhode Island Science and Technology Advisory Council. STAC provided staffing for the Commission with assistance from Clarendon Group, which conducted the primary and secondary research and foundational analysis contained within this report.