



A Partner for Prosperity
The University of Rhode Island's Impact
On the Economy of the Ocean State



UNIVERSITY OF
Rhode Island

A Partner for Prosperity:

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On the Economy of the Ocean State**

**Appleseed
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Executive Summary

The University of Rhode Island is the Ocean State's largest higher educational institution – the leading supplier of college-educated workers to the Rhode Island work force – a major employer of Rhode Island residents – one of the State's leading research centers – and a vitally important mechanism for transferring useful knowledge from University labs and lecture halls to individuals, companies and communities throughout the State. In all of these roles the University is a major contributor to the continuing development of the Rhode Island economy.

This report addresses the University's role in developing Rhode Island's human resources, as a research center and as a seedbed for new businesses – its impact as a major enterprise in its own right – and the impact of University outreach programs.

Building Rhode Island's Human Capital

Higher education is increasingly important to the State's competitiveness, and to the fortunes of its citizens. The 2000 census found that Rhode Island residents with four-year college degrees earn an average of \$38,500 – 84 percent more than those with no formal education beyond high school. About 20 percent of all Ocean State residents with four-year or higher degrees are URI graduates.

In the fall of 2002, more than 14,300 undergraduate, graduate and non-degree students were enrolled at the University of Rhode Island, making URI the State's largest institution of higher learning. In 2002 the University accounted for 22 percent of all bachelor's degrees awarded in Rhode Island, 25 percent of all master's degrees and 38 percent of all doctoral degrees.

About 64 percent of all URI students are Ocean State residents; the rest come from out-of-state. More than 45 percent of all URI alumni live in Rhode Island.

The University's educational offerings include degree programs that are specifically designed to prepare students for careers in some of Rhode Island's largest or fastest-growing industries, such as financial services, health care, biotechnology and care of the elderly. Continuing education programs in a wide range of specialties also ensure that working adults have opportunities for "lifelong learning."

URI's bachelor's degree programs in biotechnology/microbiology and biotechnology manufacturing offer notable examples. Developed in close collaboration with an industry advisory group – and with financial support from the State, Amgen and Pfizer – these programs provide Rhode Island students with the in-depth scientific and technical knowledge and higher-level skills that biotech operations require. They also provide internships with some of the State's leading biotechnology companies. By meeting a pressing need for highly-skilled workers, URI is helping the State sustain the growth of

biotech manufacturing operations such as Amgen's recently-expanded West Greenwich plant – and helping ensure the State's future in a rapidly-developing industry.

Research and Business Development

Research at URI is a major enterprise in its own right. Between 1998 and 2003, total research spending grew by an average of 9.4 percent annually, to a total of \$60.4 million. About 85.8 percent of this total was funded from federal grants and contracts; University research is, in effect, one of the State's largest "export" businesses.

Much of the research conducted at URI is directly relevant to leading and emerging industries in Rhode Island and many research programs involve collaboration between University and industry researchers. URI's Sensors and Surface Technology Partnership, for example, has worked with many of the State's leading industrial and technology companies, such as American Power Conversion, A.T. Cross and Elmwood Sensors.

One of the most notable advantages that undergraduates gain by attending a major research university is the opportunity to participate in faculty research projects. Programs such as URI's Coastal Fellows program give students an opportunity to develop more in-depth knowledge of their chosen field than they would gain from classroom courses alone. Working on "real-world" research projects can also help students develop teamwork, practical problem-solving and presentation skills. Research experience can thus help greatly enhance the skills and knowledge the URI graduates bring to the State's workforce.

University research can also lead to the development of new business ventures. In recent years, URI faculty have participated in the creation of a number of start-up businesses. Examples include Farsounder, Bioconversion and Accurate Environmental Forecasting. Development of new products and services, business and job development in Rhode Island and income to the University come from licensing the practical results of URI research.

URI as Employer

In the fall of 2002 URI employed a total of 2,437 people. If it were a private company, the University would be the State's tenth largest employer. Of URI's 2,437 employees two-thirds are paid by State operating funds and tuition. The other one-third are paid through external funding, primarily federal grants or from income generated by services such as dormitories and food services.

Faculty members and other professional staff accounted for one-half of all University employees; the remainder include clerical, technical and support service workers.

More than 97 percent of all URI employees are Rhode Island residents.

Purchasing and Construction

In fiscal year 2002 URI paid \$46.6 million to Rhode Island businesses for purchases of goods and services (including construction). Purchases from in-state companies accounted for 56 percent of all URI spending on goods, services and construction.

Between 1998 and 2003 the University spent an average of \$36 million annually on construction. During the next five years, construction spending is expected to average about \$44 million annually – enough to generate about 330 full-time-equivalent construction jobs annually. Major projects to be undertaken during this period will include new facilities for biotechnology sciences and life sciences, a new marine library and oceanographic information center and new undergraduate housing.

Statewide Impact of University Spending

Using a model created with the IMPLAN input-output modeling system, we estimate that University spending generated a total of \$209 million in economic activity in other businesses statewide and generated 2,290 full-time equivalent jobs.

Taking into account the University's own operations as well as this "multiplier" effect, we estimate that in 2002 URI generated approximately \$518 million in economic activity statewide – nearly \$5 for every \$1 in State support for URI.

State income taxes collected on the University's payroll in 2002 totaled \$4.5 million. The University also paid \$696,000 in local water, sewer and other fees. Economic activity outside the University generated through the multiplier effect yielded an additional \$4.2 million in property taxes, \$2.6 million in sales taxes and \$2 million in income taxes.

The figures cited above on the impact of University spending do not include the impact of spending by students or by out-of-state visitors to URI. Overall, we estimate that (excluding money spent on campus) URI students spent \$37 million off-campus in 2002 for housing, food, entertainment and miscellaneous other needs.

The Impact of University Outreach

The third pillar of URI's role as a public university, along with education and research, is outreach. URI has approximately 400 outreach programs servicing the community. The University defines the mission of its outreach program as follows:

The University of Rhode Island, Rhode Island's only Land-Grant, Sea-Grant and Urban Grant University, is committed to work in collaboration between the University and the external community. Outreach is the application of knowledge, research, education and service to engage the external community. It will result in mutually beneficial

relationships and will support outreach efforts of the University of Rhode Island at the local, regional and global levels.

- *Teaching* outreach typically involves conveying useful knowledge to audiences other than “traditional” undergraduate, graduate or continuing education students.
- *Research* outreach involves applied research on some real-world issue or problem, often for a “client” outside the University.
- *Service* outreach involves the practical application of knowledge acquired at the University on behalf of some external constituency or client.

Outreach can thus be thought of as a mechanism by which the value of knowledge created or acquired at URI is expanded through its practical application in communities throughout the State.

Examples of outreach activities that help strengthen the State’s economy include:

- Programs aimed at improving the quality of elementary and secondary education in Rhode Island (such as GEMS-NET, a program for improving math and science instruction);
- Programs that help prevent serious illnesses or that reduce the cost of health care (such as the Medication Education Research Center, which helps elderly, disabled and other Rhode Islanders manage their medications more effectively);
- Programs that help protect common resources that are essential to the State’s economy (such as Watershed Watch and the Narragansett Bay Partnership); and
- Programs that help make Rhode Island businesses more productive and more competitive (such as the Fisheries Extension Program and the Center for Pollution Prevention and Environmental Health).

A Look Toward the Future

As significant as URI’s contribution to Rhode Island’s economy is today, it could be even greater in the future. Reasons for the University’s growing significance to the State’s economy include:

- URI’s well-established position as the leading supplier of college graduates to the State’s workforce, at a time of growing demand for workers with higher-level skills;
- The opportunities for “lifelong learning” that the University has long provided through its continuing education programs – at a time when such learning is an increasingly important factor in workers’ employability;
- The critical strategic importance of maintaining Rhode Island’s character as an attractive place to live and work and the role the University has played in that effort;
- The steady growth of the University’s research enterprise in an era marked by the growing importance of science and technology as keys to economic growth; and

- The University’s increased effectiveness in translating the results of academic research into new businesses and jobs.

All of these factors suggest that, while the University has been a major contributor to the ongoing development of the Ocean State’s economy, it has the potential to do even more in the years ahead.

Introduction

The University of Rhode Island is the Ocean State’s largest higher educational institution – the leading supplier of college-educated workers to the Rhode Island work force – a major employer of Rhode Island residents – one of the State’s leading research centers – and a vitally important mechanism for transferring useful knowledge from University labs and lecture halls to individuals, companies and communities throughout the State. In all of these roles the University is a major contributor to the continuing development of the Rhode Island economy.

Organization of the Report

Part I of the report provides a brief overall description of the University of Rhode Island. Part II provides a context for the analysis that follows by presenting a brief overview of the Rhode Island economy.

Part III of the report examines the impact of URI as an educational institution – its role in the development of the State’s human resources. Part IV discusses the impact of URI research on the State’s economy and the University’s role in fostering the creation of new businesses.

Part V of the report describes URI as a major employer in its own right; and Part VI highlights the University’s position as a buyer of goods and services from Rhode Island companies and as a sponsor of major construction projects. Part VII analyzes the direct, indirect and induced effect (the “multiplier effect”) of University spending within the State on payroll, purchasing and construction and examines the additional impact derived from spending by students and visitors.

Part VIII examines the many, diverse ways in which the University contributes to the health of the State’s economy through its outreach activities. Finally, Part IX concludes the report with a brief discussion of why URI’s impact on the State’s economy could be even greater in the future than it is today.

Acknowledgments

This report could not have been completed without the active assistance and continued cooperation of many members of the URI community. We are grateful to all of the individuals who contributed data. We would especially like to thank Janett Trubatch, Vice Provost of Graduate Studies, Research and Outreach, Howard Foster, Associate Professor at the College of the Environment and Life Sciences, and Melissa McCarthy, Outreach Coordinator.

Financial contributions were made by the President's Office, the Research Office, the AAUP, the College of Business, the College of the Environment and Life Sciences, the Alumni Association, the Graduate School of Oceanography, and Heartlab, Inc. of Westerly, RI.

I. The University of Rhode Island: An Overview

The University of Rhode Island is the Ocean State's largest and most comprehensive higher educational institution. With broad responsibility "for expanding knowledge, for transmitting it and for fostering its application," the University plays a vital role in the State's economy and in the life of its people.

Chartered by the State legislature in 1888 as an agricultural school, it was named the Rhode Island College of Agriculture and Mechanic Arts in 1892. The College's first graduating class, which included seventeen students, received their degrees in 1894.

In 1909 the College's program was expanded to include other fields of study, and it was renamed Rhode Island State College. The school grew steadily over the next four decades; and in 1951, by an act of the General Assembly, became the University of Rhode Island.

In the fall of 2002, the University enrolled 14,447 undergraduate, graduate and non-degree students in ten colleges:

- The College of Arts and Sciences
- The College of Business Administration
- The College of Engineering
- The College of the Environment and Life Sciences
- The College of Human Science and Services
- The College of Nursing
- The College of Pharmacy
- The Graduate School of Oceanography
- The College of Continuing Education
- University College

All of these schools offer both undergraduate and graduate degrees, except University College – which does not grant degrees – and the School of Oceanography which, as its name implies, offers only graduate programs.

The educational and research activities of the ten schools occur primarily on four University campuses:

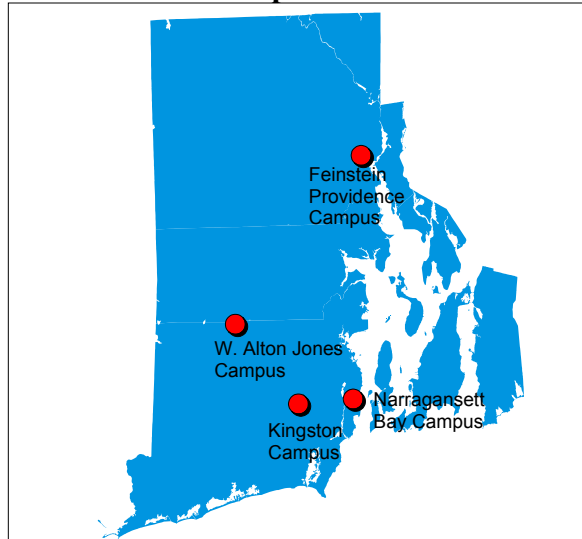
Kingston – the University’s 1,200-acre main campus;

Narragansett Bay – a 153-acre complex that houses the Graduate School of Oceanography and the Coastal Institute;

Providence – home of the College of Continuing Education and several other University departments and programs, located in the historic Shephard Building in the city’s resurgent downtown area; and

W. Alton Jones – a 2,300-acre preserve of forests, lakes and streams that includes an Environmental Education Center, conference facilities and summer camps.

Figure 1
URI Campus Locations



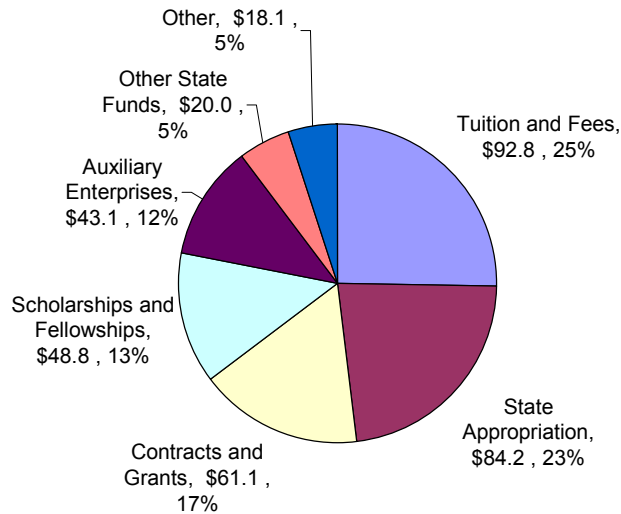
During the fall of 2002, more than 13,000 students were enrolled in undergraduate and graduate degree programs at URI, and 1,360, in non-degree courses.

The University is one of Rhode Island’s leading research institutions. It is among the foremost centers of oceanographic research in the U.S.

URI’s operations also include more than 400 “outreach” programs – programs that utilize the University’s educational, research and service capabilities to benefit people and communities throughout Rhode Island and beyond. Outreach activities can include short-term practical training courses for groups as diverse as apparel industry workers, commercial fishermen, and public school teachers; applied research efforts on behalf of local government agencies, industry groups and individual companies; and a wide variety of public and community services.

University revenues in 2002 totaled \$368.2 million, of which \$104.3 million – 28 percent – came from State funds, including \$84.2 million in direct state appropriations¹. The remainder came from operating revenues such as student tuition and fees, federal grants and contracts, and from investment income and gifts. Total revenue is broken down by source in Figure 2.

Figure 2
University Revenues, FY2002



To set the context for our assessment of the University’s economic impact, the next section of the report focuses on the recent performance of the Rhode Island economy.

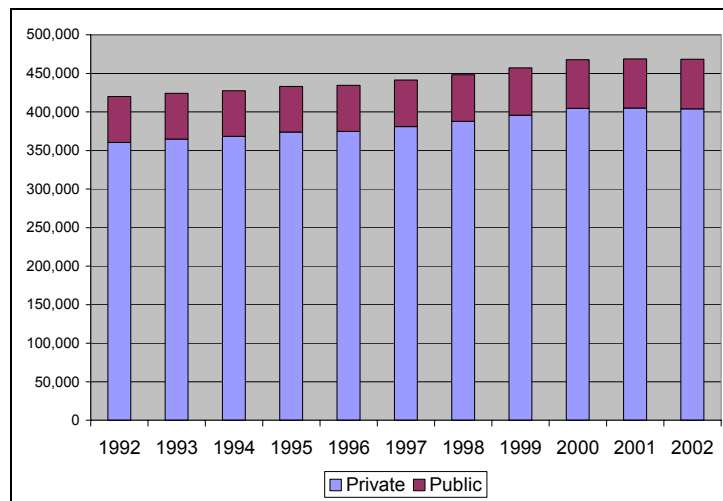
¹ In addition to \$84 million direct appropriation, the State also contributed \$9.8 million of State Capital Plan Funds and funded another \$10.3 million of university expenditures with the proceeds of general obligation bonds.

II. The Rhode Island Economy

In 2002 average annual wage-and-salary employment in Rhode Island fell by 0.06 percent. This represented a loss of just 290 jobs from the annual average for 2001; it means that total employment in the Ocean State, despite some month-to-month variation, has remained fairly stable since 2000. Nevertheless, the loss of jobs in 2002 ended a ten-year run of uninterrupted growth that had seen total private-sector payroll employment increase by 12.4 percent since 1992.

While a decline in employment and a rise in unemployment are never desirable, Rhode Island has in fact fared better during the recession of 2001-2003 than many other states. In Massachusetts, payroll employment declined by 2.3 percent between 2000 and 2002; in New York, by 1.8 percent. The relative mildness of the recession in Rhode Island is evident from the fact that in 2003, total employment grew once again, by approximately 800 jobs.

Figure 3
Employment in Rhode Island, 1992-2002



Source: Rhode Island Department of Labor and Training

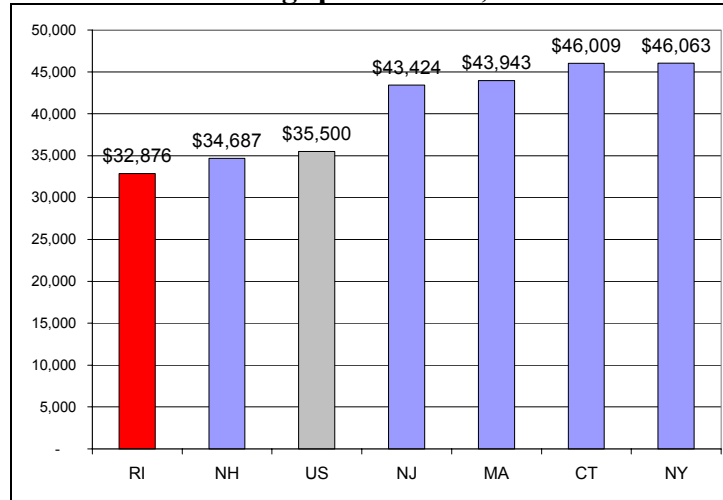
The fact that Rhode Island has fared better than some other states during the recession should not, however, be taken as a reason for complacency. Over the past decade, Rhode Island has ranked behind other states on several measures of economic performance and competitiveness.

- Rhode Island ranked next-to-last among the New England states in private-sector job growth between 1992 and 2001, and third from last among all states nationwide (behind only Hawaii and Connecticut).²

² Rhode Island Department of Labor and Training, *Ten Years Later....An Analysis of Rhode Island Employment, 1992-2001* (December, 2002), not paginated.

- The erosion of the Ocean State’s manufacturing base has continued unabated during the past decade. In percentage terms, Rhode Island lost more manufacturing jobs between 1992 and 2001 – 18.7 percent of its 1992 base – than any other state except Alaska.³
- Earnings per worker in Rhode Island averaged \$32,876 in 2001— 7 percent below the U.S. average. As Figure 4 shows, the gap between Rhode Island and several neighboring states is even greater.

Figure 4
Earnings per Worker, 2001



Source: Bureau of Economic Analysis

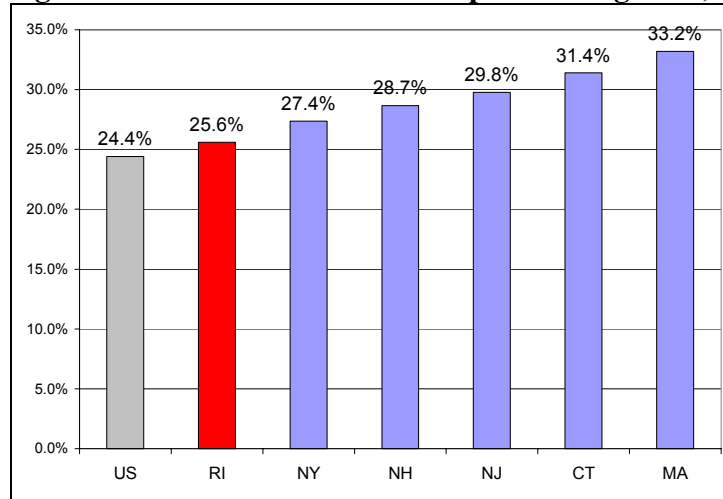
- While Rhode Island has a higher percentage of college graduates among its adult residents than the U.S. as a whole, it lags behind several nearby states on this important measure (Figure 5).

As the nation’s economy begins to rebound, Rhode Island has some notable strengths on which to build. They include the spectacular natural beauty of the Atlantic Ocean and Narragansett Bay – communities that offer a diverse array of attractive places to live and work – rich historical resources – and living costs that are generally lower than those in surrounding states. But to take advantage of these strengths, the State also needs to be better prepared to compete effectively in a global economy that is increasingly driven by ideas, innovation and information.

The Ocean State’s universities – and the University of Rhode Island in particular – have played a critical role and continue to play in ensuring that Rhode Island is prepared to take advantage of the opportunities that the next round of economic growth will present. As the State’s largest institution of higher education, URI helps Rhode Island residents acquire the knowledge and higher level skills they need to succeed in today’s economy.

³ Ibid

Figure 5
College Graduates as a Percent of Population Age 25+, 2000



Source: US Bureau of Census

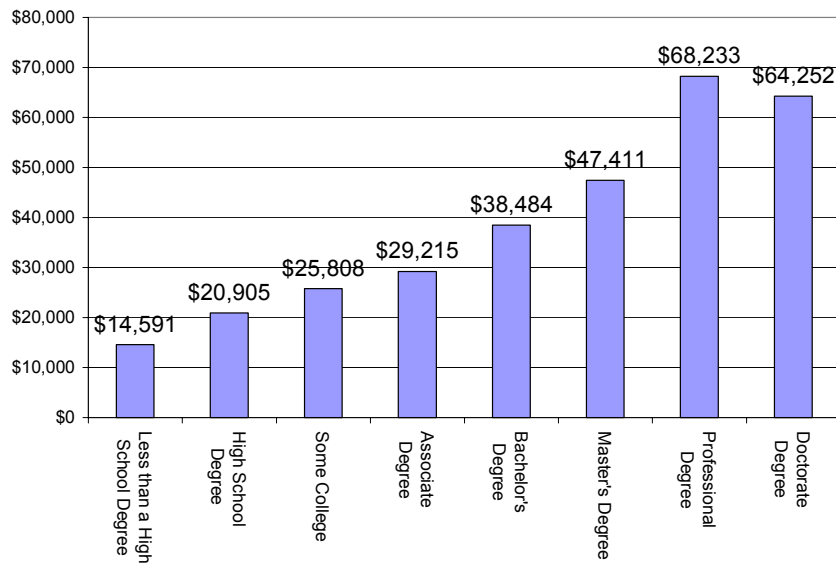
As one of the State's leading research centers, the University also helps create the knowledge that drives the growth of the Rhode Island economy. Through its outreach programs, the University plays a unique role in helping communities and businesses throughout Rhode Island benefit from the creation of knowledge. Through its technology transfer activities, the University contributes to business formulation and job growth in the State.

III. Building Rhode Island’s Human Capital

Human capital – the knowledge and skills that workers accumulate through education and experience – is one of the most important factors affecting the growth of regional economies. Between 1960 and 1990, population and income growth in U.S. cities and metropolitan areas was closely correlated with levels of human capital endowment, as measured by the percentage of all adult residents who were college graduates in 1960. The relationship between human capital and economic growth persisted through the 1990’s.⁴

The economic value of a college education is evident in data from the 2000 Census on the variation in earnings among Rhode Island residents, according to the level of schooling completed (Figure 6). *Rhode Islanders with a four-year college degree earned an average of 84 percent more than those who had no formal education beyond high school. Those with master’s degrees earned an average of 127 percent more than high school graduates.*

Figure 6
Earnings of RI Residents by Educational Attainment, 1999



Source: US Bureau of Census

Higher education doesn’t just benefit the people who earn degrees. It has important spillover effects as well. James Rauch of the University of California has found that increasing the average level of education in a metropolitan area by one grade increases

⁴ Edward Glaeser, Jose Scheinkman and Andrei Schleifer, “Economic Growth in a Cross-Section of Cities,” *Journal of Monetary Economics* (1995) pp. 117-143; Glaeser and Jesse Shapiro, *Is There a New Urbanism? The Growth of U.S. Cities in the 1990’s* (Cambridge: National Bureau of Economic Research Working Paper, July 2001) p. 2.

“total factor productivity” by 2.8 percent. (Total factor productivity is a measure of the increase in a nation’s or a region’s output that results not from increasing the total volume of human labor, or total investment in plant and equipment, but from “working smarter.”)⁵

The critical importance of human capital means that universities are major participants in the process of economic development. As Richard Florida has noted:

*The most critical contribution of the university to economic development is talent. Talent is the key resource of the knowledge economy...Smart people do not necessarily respond to monetary incentives alone, they want to be around other smart people...The fact is that good people attract other good people, and places with lots of good people attract other good people, and places with lots of good people attract firms that want access to talent, creating a self-reinforcing cycle of growth.*⁶

Because highly-talented people are especially mobile, cities and regions that want to prosper in today’s economy must constantly replenish their supply of talent. Colleges and universities play a central role in this process.

*Industrial representatives have repeatedly stated that universities’ primary contribution to technological innovation lies in the training of students... Students are a means by which new scientific findings and technologically relevant knowledge are transferred from campus to firm.*⁷

⁵ James Rauch, “Productivity Gains from Geographic Concentrations of Human Capital: Evidence from the Cities,” *Journal of Urban Economics*, vol. 34, pp. 398-99.

⁶ Richard Florida and Wesley Cohen, “Engine or Infrastructure? The University’s Role in Economic Development,” in Branscomb, Kodama and Florida, op. cit., pp. 605-606.

⁷ Irwin Feller, “The American University as a Performer of Basic and Applied Research,” in Branscomb, Kodama and Florida, op. cit., pp. 82-84.

URI Students and Alumni

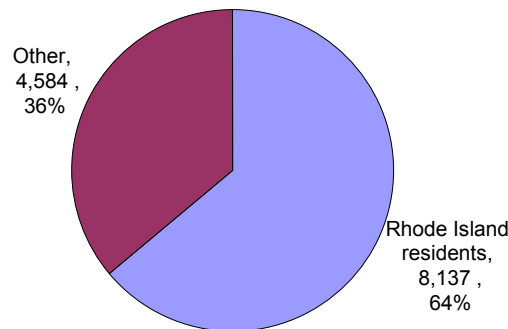
With a total of 13,067 students enrolled in undergraduate and graduate degree programs in the fall of 2002 and an additional 1,360 taking credit courses but not enrolled in degree programs, the University of Rhode Island is the Ocean State’s largest educational institution. While 86 percent of all undergraduates are full-time students, more than half (52 percent) of all URI graduate students are enrolled part-time. As Table 1 shows, undergraduates account for about 80 percent of URI’s enrollment.

Table 1
URI Degree-seeking Students by School, Fall 2002

	Undergraduate	Graduate	Total
Arts & Sciences	4,411	686	5,097
Human Sciences & Services	1,881	394	2,275
Business Administration	1,459	284	1,743
Engineering	927	160	1,087
Environment & Life Sciences	735	265	1,000
Pharmacy	494	61	555
Nursing	397	100	497
University College	492		492
Continuing Education	234		234
Graduate School of Oceanography		87	87
Total	11,030	2,037	13,067

About 62 percent of all undergraduate degree students and 66 percent of all graduate degree students are Rhode Island residents; the rest come to URI from out-of-state and out of the country (Figure 7).

Figure 7
Place of Residence of Degree-seeking Students, Fall 2002



During the academic year 2001- 2002, the University awarded 1,893 bachelor’s degrees, 565 master’s degrees and 77 doctoral degrees. URI’s leadership among the State’s colleges

and universities is evident from its share of all degrees granted. During the academic year 2000-2001, URI accounted for⁸:

- 22 percent of all bachelor's degrees awarded in Rhode Island;
- 25 percent of all master's degrees; and
- 38 percent of all doctoral degrees.

URI ranked first among Rhode Island's educational institutions in the provision of bachelor's and master's degrees and second to Brown in the provision of doctoral degrees.

In addition to providing its graduates with a broad grounding in the higher-level skills that an ever-changing economy requires, URI also offers its students a wide range of opportunities for more specialized training in areas that are especially relevant to leading or (fast-growing) Rhode Island industries. (See information about training in biotechnology on page 19.)

Out of 82,500 living URI alumni, 37,554 – 45.5 percent of all URI graduates – live in Rhode Island. Nearly 20 percent of all Rhode Island residents with four-year or higher degrees are URI graduates. The University has more graduates who live in Rhode Island than the State's three largest private colleges (Brown, Johnson and Wales and Providence) combined.

Continuing Education

In a rapidly-changing economy, higher education cannot be seen solely as “post-secondary” education – as the production of young adults with bachelor's or master's degrees. Today, even the most highly-educated workers need to acquire new skills and new knowledge in order to keep up. And increasingly, they need to be able to acquire skills and knowledge that will allow them to change careers – not just once but several times during their working lives. Higher education today has truly become “lifelong learning.”

URI offers non-credit certificate programs in a number of areas for people who want to broaden their skills or prepare for a new job. They include courses in management, training and development and multimedia. The University also offers training in basic computer applications for office workers. Other non-credit programs are designed to help Rhode Islanders meet State requirements for licensing in fields such as food safety, pharmacy administration and accounting.

The University also offers continuing education programs for teachers, designed to meet in-service training needs for certification of teachers in grades K through 12. These programs address both academic subjects and topics such as classroom management.

⁸ According to the Rhode Island Office of Higher Education, URI conferred 1,803 bachelor's degrees, 491 master's degrees and 95 doctoral degrees in the academic year 2000-2001.

The University's School of Continuing Education also provides for-credit programs under contract with major Rhode Island employers. These programs have ranged from basic adult education courses to graduate courses in chemistry, electrical engineering and business; and special workshops on biotechnology. Client companies have included Amgen, CVS, Raytheon, G-Tech, On Semiconductor, Pfizer and the Naval Education and Training Center.

In addition to these for-credit, non-degree programs, the University offers a wide range of non-credit training programs for working adults in a variety of industries. Several of these programs are described in Part VIII of the report.

Preparing Students for Careers in Biotechnology

Rhode Island's biotechnology industry today employs about 2,600 people and has the potential to be one of the State's major growth industries in the years ahead. Recognizing this potential, URI's College of the Environment and Life Sciences began several years ago to plan programs that would equip students with the scientific and technical knowledge and higher-level skills that biotechnology companies require. In 2002 the College began offering a biotechnology option for students pursuing a bachelor's degree in microbiology. This program, which includes opportunities for internships at Amgen, Pfizer, Rhode Island Hospital, HybriGene and other companies, prepares students for jobs in areas such as biotech research, operations, quality control and regulatory affairs. The first five students graduated from the program in 2003 – and all were hired by the companies at which they had worked as interns.

In the Fall of 2004 the College also launched a new bachelor's degree program in biotechnology manufacturing. The program was designed in collaboration with an industry advisory group and implemented with \$575,000 in support provided by Governor Donald Carcieri, the General Assembly, the Rhode Island Human Resource Investment Council, Pfizer and Amgen. The program uses an innovative "1+3" approach. It begins with an intensive one-year program offered at URI's Providence campus, including courses in biology, chemistry, biotechnology, computer science and biomanufacturing. A full-time summer internship follows. At the completion of the internship, students are expected to be ready for employment in biotech manufacturing operations, quality control, administration, sales and other areas. The remainder of the program is structured to enable students to complete their degrees while working.

The biotech manufacturing program's first class of 13 students will complete its first year in 2004. URI is currently planning to expand the program to 50 students in the Fall of 2004.

Rhode Island's ability to sustain the growth of its biotech industry and to have it become a major employer of Ocean State workers, will ultimately depend on its ability to grow beyond its role as a center of biotechnology research and development; and become a center of biotech manufacturing. The State has already taken major steps in this direction – in particular, with the location of a major Amgen manufacturing operation in a 250,000 square-foot plant in West Greenwich that now employs about 700 people. A recent 500,000 square-foot expansion at the same site will eventually result in the growth of Amgen's West Greenwich work force to 1,500.

In order to sustain this kind of growth, however, Rhode Island will need to have available the kind of highly-skilled workers that these complex, technologically sophisticated operations demand. Through its continuing partnership with Amgen and other biotech companies, URI is playing a major role in enabling the Ocean State to become a major center for biomanufacturing.

IV. Research and Business Development

For the past half-century, basic research has played a central role in the growth and development of the U.S. economy. In 1999 the Committee for Economic Development reported that:

Basic research in science and engineering has made a major contribution to the growth of the U.S. economy. Economic returns on investments in basic research are very high. In addition, the returns to the nation from basic research investments are substantially higher than the returns to private firms, since advances in fundamental knowledge tend to be widely dispersed and exploited in innovations that deliver substantial economic benefits over a lengthy period.

Without question, the most important institution in American basic research is the research university. The research university system has become the nation's largest basic research enterprise.

CED also found that:

Basic research performed in major universities (and in other public and private labs) often has a large indirect impact on the economy of the regions where the universities are located.⁹

University research contributes to regional economic growth in several ways.

- Each year research universities attract millions of dollars in federal and corporate research funds – money that is spent locally on salaries, supplies, equipment and overhead costs.
- The opportunity to work side by side with faculty researchers can greatly enhance the quality of both undergraduate and graduate students' education. This experience can in turn enhance the skills and knowledge that university graduates can offer to the region's employers.
- Contracting or collaborating with university researchers can be an efficient way for companies to acquire new knowledge, solve applied research problems and recruit new employees.
- Strong university research programs can help make the region an attractive location for corporate research and development facilities.

⁹ Committee for Economic Development, *America's Basic Research: Prosperity through Discovery* (New York, 1999), pp. 2, 11, 19.

- University research sometimes leads directly to the development of new products and the creation of new businesses.

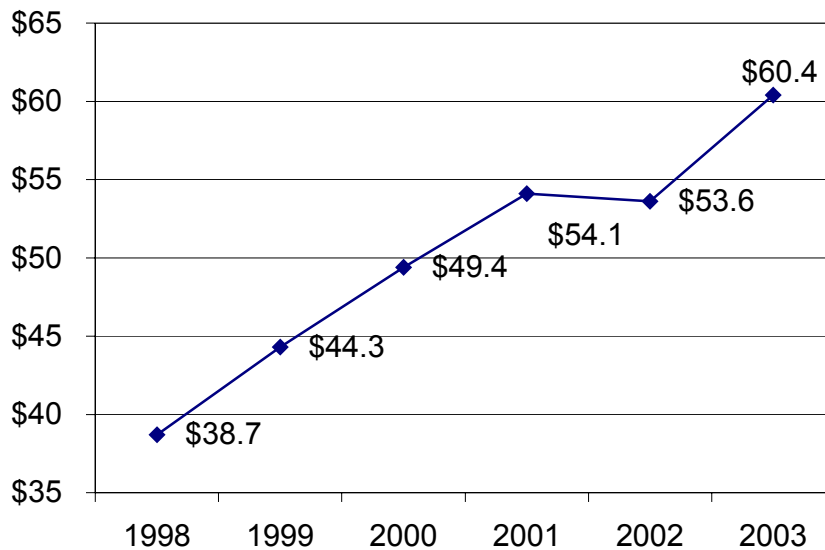
All of these effects are evident at the University of Rhode Island.

Research Spending at URI

In 2003 research spending at the University of Rhode Island totaled \$60.4 million. Approximately 85 percent of all research spending at URI is funded through federal grants and contracts; the rest is financed with State funds, or with corporate or other private funding. Federally-funded research thus represents one of the most significant ways in which the University attracts revenues from out-of-state that are then translated into local spending on payroll and purchases of goods and services.

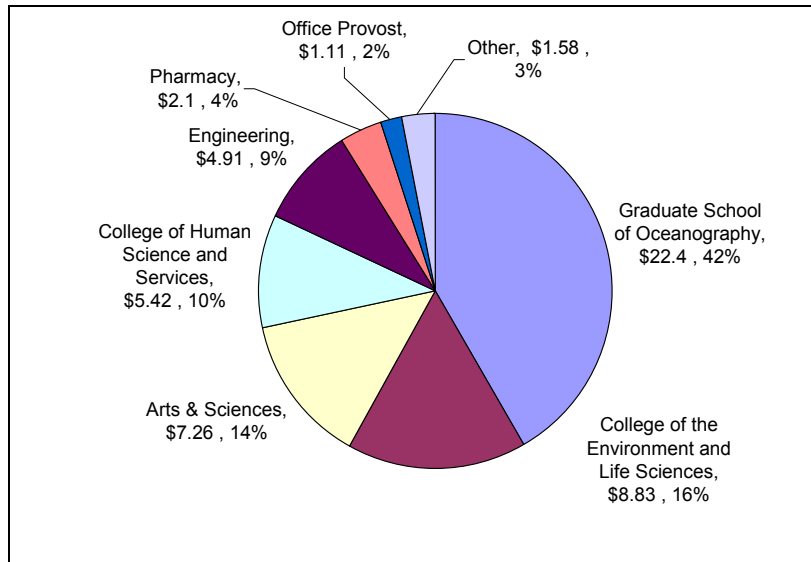
Between 1998 and 2003, research spending at URI rose by 56 percent – an average of 9.4 percent annually – with federal funds accounting for most of that growth. Federally-funded research is in effect an important growth business for the Ocean State.

Figure 8
Growth in Research Spending at URI, 1998-2003
(in \$ millions)



Among the University’s various colleges, the Graduate School of Oceanography is the leader in attracting research funding from outside sources. In 2002 the School accounted for nearly 42 percent of all research spending at URI. The College of the Environment and Life Sciences (16.5 percent of total research spending) and the College of Arts and Sciences also attracted substantial support.

Figure 9
2002 Research Spending by School (in \$millions)



Supporting Key Industries

Much of the research that is conducted at URI is directly relevant to leading Rhode Island industries. The following research programs illustrate the breadth and variety of URI’s research relationships with industry.

URI’s *Sensors and Surface Technology Partnership* was established in 1996 with \$375,000 in seed funding from the University. Participating faculty members focus on topics such as the use of infrared imaging to detect food pathogens; the development of microsensors; and the development of temperature-sensitive polymer-based pigments. These pigments can be used, for example, in road signs that will change color when temperatures fall below levels at which roadways begin to freeze; or in fabrics that signal changes in body temperature.

In addition to federal research funds, the program draws support from its industry partners. These include the U.S. Navy, as well as some of Rhode Island’s leading industrial and technology companies. Table 2 lists several Rhode Island companies with which the Partnership has worked to date. In exchange for their support, companies get access to the latest results of SST research and discounts on fees for use of highly sophisticated equipment in University labs. Partnership events such as “poster sessions” give companies an opportunity to identify and recruit promising students. Partner companies may also provide direct funding for specific applied research projects that are particularly relevant to their business.

Table 2
Rhode Island Companies that Have Worked
with the URI Sensors and Surface Technology Partnership
(as of May 2003)

Company	Location
Alpha Omega Instruments	Cumberland
American Power Conversion	West Kingston, West Warwick, East Providence
A. T. Cross	Lincoln
Elmwood Sensors*	Pawtucket
Fenwal Electronics*	Pawtucket
Sulzer Metaplas**	Woonsocket
Tanury Industries	Lincoln
Technical Materials, Inc.	Lincoln

* Now part of Honeywell Sensing and Control

** Formerly DB Thin Films

Biomedical research in Rhode Island is both a significant industry in itself and a seedbed for the growth of the State's biotechnology industry. In an environment of intense competition for federal research funds, one of the keys to strengthening the State's position in this industry is to continue developing a corps of talented junior investigators who can compete effectively for grants from the National Institutes of Health. In order to broaden the base of research talent in the State, seven Rhode Island institutions led by URI in 2001 created the ***Biomedical Research Infrastructure Network (BRIN)***.

BRIN offers junior researchers at the participating institutions (URI, Brown, Bryant, Providence, Roger Williams, Rhode Island College, and Salve Regina University) access to core research facilities and equipment, located on the URI campus. BRIN also includes a network of mentors – senior researchers at Rhode Island institutions who help their younger colleagues develop and implement research projects in areas such as functional genomics, biomedical engineering, bioinformatics, carcinogenesis, and environmental toxicology. To date, NIH has provided \$7.6 million to support BRIN's facilities and activities; and about 100 faculty members, researchers and students have participated in its programs.

Since 1978 the ***Cancer Prevention Research Center*** has attracted more than \$60 million in federal funding. The Center has developed a highly successful approach to preventing disease and promoting health through changes in behavior. After initially focusing on smoking cessation, CPRC has successfully adapted its technology to preventing alcohol and drug abuse, diabetes, hypertension and other health problems.

With a growing focus on the importance of behavior change as the key to improving health, CPRC gives Rhode Island a potential source of competitive advantage in what is likely to be a growing segment of America's health care industry.

The University's federally-funded *Sea Grant* program conducts research on a wide range of issues that are of critical importance to Rhode Island's ocean-dependent economy. Researchers in URI's department of fisheries, animal and veterinary science, for example, have used the techniques of molecular biology to identify the source of several diseases affecting local species of fish and shellfish and to begin developing ways to protect against them.

For One Biotech Company, URI Research Helps Make the Grass Greener in Rhode Island

The opportunity to work with University researchers not only benefits local companies; in some cases it can also attract businesses to Rhode Island. URI's relationship with HybriGene provides an example. Founded in 1999 and based in Oregon, HybriGene is engaged in the development of hybrid cereal crops and new turfgrass products through genetic modification. The company is developing grasses and cereals that, because they would need less water, fertilizer or pesticide, would reduce the negative impacts of cultivation on the environment.

In 2003, HybriGene entered into a research agreement with URI, under which its main research laboratory was moved to West Kingston, and URI and company researchers began to collaborate on a variety of projects. URI has 15 interns working at HybriGene's lab; and will share in any profits the company earns on new products developed there.

Student Participation in University Research

Studying at a university with a large and diverse research enterprise can greatly enhance the quality of students' educational experience at both the undergraduate and graduate levels. Participation in research projects helps students develop a much deeper understanding of both subject matter and scientific methods. It can provide students with valuable experience in working as part of a team and in presenting the results of their work both orally and in writing. If the research program in which a student is participating involves collaboration between university and industry researchers, he or she may also have a chance to learn first-hand about the role of research and development in business; and to develop contacts with potential future employers.

URI's *Coastal Fellows Program*, for example is based on a recognition that if students are to learn not only *about* environmental issues, but also how to address them effectively, they need to gain experience in applied research and to develop practical problem-solving skills.

The program addresses this need through a combination of classroom training and applied research work. In 2003, 48 undergraduate Coastal Fellows worked as part of several teams that also included faculty members, graduate students, post-doctoral researchers and other environmental professionals. Each student spent a minimum of eight months (20 hours per week during the summer and 10 hours per week during the fall semester) focusing on a particular applied research problem – how to control invasive plants in coastal areas, for example; diseases affecting local shellfish populations; and studies of tick-borne diseases. Coastal Fellows also participated in a seminar designed to help them communicate the results of their work more effectively; and were given the opportunity to present their results at a “poster session” at the end of the fall semester.

One student has described the program’s value this way:

I can finally utilize some of the knowledge I had so painstakingly acquired in my classes in a real-world situation. The ability to improvise and solve problems is important.

URI’s ***Sensors and Surface Technology Partnership*** also provides research opportunities for students. During the 2000-01 academic year, 13 undergraduates and 7 graduate students participated in the Partnership’s work. Each year, some students receive fellowships that allow them to pursue their own research under the Partnership’s auspices. Fellowship students also participate in a special interdepartmental seminar on sensors and surface technology; and get to present the results of their work at an annual “poster session” with representatives of Partnership companies.

From Lab to Market

In some cases, work done in University labs, or other work by University faculty members, can lead directly to the creation of new businesses offering new products or services. The process of turning University research into new products and new businesses is managed by URI Research Office’s Division of Industrial Research and Technology Transfer. University researchers are required to disclose to the Division any inventions or discoveries that might have some commercial application. The Division then determines whether to seek patents on these inventions; and, after patents are obtained, negotiates licensing agreements with either existing businesses or newly-created ventures that, in exchange for a fee, permits the licensees to use the University’s “intellectual property” for commercial purposes.

In 2002, the Division received 21 invention disclosures from members of the URI community, filed 9 new patent applications, obtained 5 patents and negotiated one agreement for commercial use of technology patented by the University.

URI faculty members have also created new ventures that are not based on technology licensed from the University. Examples include:

- **Optigain**, a developer of electro-optical devices founded in 1990 by Harish Sunak, Professor in Electrical Engineering, and located in Peace Dale, RI.
- **FarSounder**, a developer of advanced sonar systems, founded by Professor James Miller of the Graduate School of Oceanography in 2001. (See the profile of the company below.)
- **Boothroyd-Dewhurst**, founded in 1985 by Professors Jeffrey Boothroyd and Peter Dewhurst. The company, located in Wakefield, developed software to analyze the cost effects of design decisions during the product development cycle. Boothroyd and Dewhurst were awarded a National Medal of Technology for the development and commercialization of their product.
- **BioConversion**, based in Warwick, RI and founded in 2001 by Professor Gene Park, is developing improved food products for fish.
- **Accurate Environmental Forecasting** of Narragansett, founded in 1999 by Professors Lewis Rothstein and Isaac Ginis of the Graduate School of Oceanography. Developed during the 1990s, Rothstein and Ginis's hurricane forecasting model was adopted by the National Weather Service in 2001 as the nation's first operational coupled-ocean-atmosphere forecast model.

Saving Ships, Money – and the Marine Environment

An idea introduced six and a half years ago during one of Professor James Miller's classes at URI's Graduate School of Oceanography led to a product that was recently introduced to the commercial market. A novel three-dimensional sonar will greatly enhance vessels' ability to avoid collisions. The new technology can potentially save the marine industry billions of dollars – and avoid the sometimes catastrophic environmental damage that collisions at sea can cause.

Professor Miller and former student Matthew Zimmerman began developing their marine navigation technology at the University of Rhode Island with assistance of the Naval Undersea Warfare Center. After building five generations of prototypes, FarSounder – the Providence-based company founded by Miller and Zimmerman in 2001 – recently began commercial production of their marine navigation technology. FarSounder expects to grow from its current six employees to 20 by the end of 2005. Currently, the company's entire technical staff is composed of URI graduates.

V. The University as Employer

In addition to its role in building the Ocean State’s human capital and in creating the new knowledge that powers the growth of the State’s economy, the University of Rhode Island is itself a major employer. In the fall of 2002, the University had 2,437 employees. If it were a free-standing entity, URI would rank tenth among Rhode Island’s non-governmental employers. Of URI’s 2,437 employees two-thirds are paid by State operating funds and tuition. The other one-third are paid through external funding, primarily federal grants or from income generated by services such as dormitories and food services.

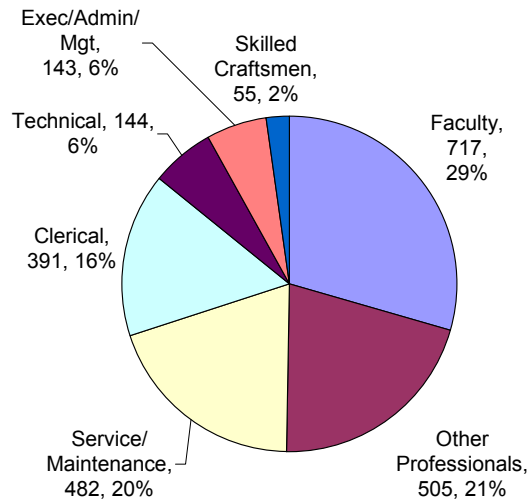
Table 3
Largest Non-Governmental Employers in Rhode Island
Compared with URI

Rank	Company	Location	Rhode Island Employees
1	Lifespan	Providence, East Providence, Newport	10,082
2	Diocese of Providence	Providence, Warwick, Newport, Woonsocket	5,630
3	CVS Corporation	Woonsocket, multiple locations	5,622
4	Care New England	Providence, Warwick	5,608
5	Stop & Shop	Multiple locations statewide	4,555
6	Brown University	Providence	4,450
7	Citizens Financial	Multiple locations statewide	4,100
8	Fleet Financial	Multiple locations statewide	3,967
9	Jan Companies	Multiple locations statewide	3,365
→	URI	Kingston, Providence, Narragansett Bay	2,437
10	RIARC	Multiple locations statewide	2,383
11	Shaw’s Super Markets	Multiple locations statewide	2,100
12	General Dynamics	North Kingstown, Middletown	2,075
13	Met Life	Warwick, West Warwick	2,000
14	Wal-Mart	Multiple locations statewide	1,875
15	Raytheon	Portsmouth, Middletown	1,749

Source: Rhode Island Economic Development Corp.

University employees represent a wide range of occupations, from senior faculty members and other professionals to clerical, technical, maintenance and support service workers. As Figure 10 shows, faculty members account for more than a quarter of all University employment; other managerial and professional staff also account for more than a fifth.

Figure 10
Employment by Occupation, 2002



Gross wages and salaries paid by the University in 2002 to permanent staff totaled \$121.4 million. Including benefits, holiday pay and overtime payments, the permanent payroll in FY 2002 was \$182 million, about 31 percent of which was state-funded. Other major funding sources were tuition and fees, contract and grants and revenue from auxiliary enterprises.

In addition to permanent staff, the University also employs graduate assistants, student workers and temporary employees. An additional \$52 million was paid to these employees during FY 2002.

URI employees are overwhelmingly Rhode Island residents. In the fall of 2002, 97.5 percent of all University employees lived in the Ocean State.

VI. Purchasing and Construction

In addition to its role as a major employer, the University contributes to the health of the State's economy through its purchases of goods and services from Rhode Island companies and through its sponsorship of major construction projects.

Purchasing

In fiscal 2002, URI spent approximately \$83.3 million on purchases of goods and services (including construction). Of this total, \$46.6 million – about 56 percent of all spending on goods and services – was spent on purchases from Rhode Island companies. At \$23.8 million payments to construction contractors accounted for about half of all payments to in-state vendors. Other types of goods and services on which the University spent at least \$500,000 in 2002 are listed in Table 4.

Table 4
Largest In-State Purchases, FY2002
(in \$millions)

<u>Product</u>	<u>In-State Spending</u>
Electricity	\$ 2.34
Architecture/engineering	2.31
Miscellaneous operating supplies	1.48
Convocation center equipment	1.35
Unprepared food	0.97
Insurance	0.87
Household, laundry and cleaning	0.83
Miscellaneous repairs and	0.73
Building and grounds maintenance	0.72
Leases	0.62

Construction

As noted above, construction accounts for nearly two-thirds of URI's payments to Rhode Island companies for goods and services. University construction contributes to the State's economy in several ways:

- It is a major source of business for Rhode Island construction contractors and suppliers.
- It generates hundreds of full-time-equivalent jobs each year for Rhode Island construction workers.
- It strengthens the University's capacity to fulfill its mission of education, research and public service.

Between 1998 and 2003, the University spent an average of \$35.8 million annually on construction. Major projects completed or under way during this period have included:

- The \$60 million Thomas Ryan Center, a 7,700-seat sports and convocation center;
- The \$12 million Boss Arena, a 2,500-seat ice rink;
- An \$11 million renovation of Ballentine Hall, home of the College of Business Administration; and
- A \$6 million renovation of Green Hall, which now houses several administrative offices.
- A new \$8 million, 50,000 square-foot research building for URI's Coastal Institute.
- Renovation of six residence halls, at a total cost to date of \$36 million.

During the next five years, the impact of University construction is likely to increase. Planned construction spending for fiscal years 2004 through 2008 is expected to total \$221 million – an average of \$44 million annually. Major projects that have been approved or proposed include:

- A \$50 million expansion and reconstruction of facilities for Environmental Biotechnology and the Biological Sciences;
- A new \$13 million building for the Pell Marine Library/Oceanographic Information Center;
- Development of 500 to 800 apartment or suite-style units for undergraduate students, at a cost of \$70 million;
- A new \$10 million dining hall;
- Further renovation of existing residence halls; and
- Renovation of several classroom and administration buildings.

Implementation of the University's proposed construction program would on average generate more than 300 full-time-equivalent jobs each year for the next five years in construction and related industries.

VII. Statewide Economic Impact of URI's spending

As a major enterprise in itself, URI's contribution to Rhode Island's economy is not limited to its spending on payroll, purchasing and construction. Part of the wages that University employees take home is spent locally on housing, food, transportation, entertainment and other goods and services. Rhode Island companies with which the University does business in turn pay the wages of their own employees, and buy goods and services from their own local suppliers.

Measuring the Multiplier

Using an input-output model, we can quantify the "multiplier" effect of University spending. An input-output model can be envisioned as a very large spreadsheet that lists hundreds of industries down the left-hand side (as buyers), and lists the same industries across the top (as suppliers). The model allocates money spent by a given industry – call it Industry A – across all of the other industries from which it buys goods and services. Each of these supplier industries in turn purchases goods and services from its own set of supplier industries. The model thus allows us to trace the impact of each additional dollar of spending by Industry A as it ripples through the economy.

To measure the multiplier effect of University spending, Appleseed used a model, created with the IMPLAN input-output modeling system, tailored to reflect the structure of Rhode Island's economy. We estimate that in FY 2002 University spending was responsible for approximately \$208.6 million of economic activity in Rhode Island. This translates into an estimated 2,290 full-time equivalent jobs at other Rhode Island businesses, accounting for approximately \$66.0 million in employee compensation. This estimate of URI's overall economic impact does not include the impact of spending by students and by visitors.

We can also view URI's overall economic impact relative to the funds that the State invests each year in the University's operations. In 2002, URI generated \$2 in economic activity at *other Rhode Island businesses* for every dollar the State contributed to the University's budget¹⁰. Including the University's own operating revenue of \$309.2 million¹¹, URI generated more than \$517.8 million in statewide economic activity – almost 5 times the State's investment of \$104.3 million.

¹⁰ State appropriations, including direct appropriation and expenditures from State Capital Plan funds and General Obligation Bond Funds, totaled \$104.3 million in FY2002

¹¹ The total revenue does not include (1) \$48.8 million in scholarships, fellowships and other student aid which the University receives but passes on to students; (2) the \$10.3 million state contribution made with proceeds from general obligation bond funds which does not pass through the University but is spent directly by the state on university-related projects.

Spending by Students and Visitors

In addition to the economic impact that it generates through its own spending, the University generates economic activity through spending by its students and by out-of-state visitors to URI. Using estimates of student living costs provided by the University's financial aid office, we estimate that approximately 3,500 URI students living in off-campus apartments spent approximately \$22.9 million on food and lodging in 2002.

In addition, all URI students (including those who live on campus) spend money off-campus for a wide variety of other purposes – on entertainment, clothing, local transportation, and other personal items. We estimate that such spending totaled \$14.1 million in 2002. Overall, off-campus student spending in 2002 thus totaled approximately \$37 million.

Visitor spending is more difficult to estimate. Like most other colleges and universities, URI does not keep a comprehensive count of visitors to its campus. We know, however, that commencement ceremonies and related activities attract about 14,000 people to the campus each year. During 2001-02, athletic events and major conferences are estimated to have attracted approximately 13,800 people. Taking into account visits by high school students who are considering URI (and their parents), as well as visits to students by friends and family members, we can conservatively estimate that at least 50,000 people annually visit the URI campus. While no detailed data on URI visitor spending is currently available, surveys conducted at other institutions suggest that campus visits typically generate approximately \$200 in local spending. Spending by URI visitors would thus total approximately \$10 million annually.

Impact on State and Local Taxes

URI's operations and its multiplier effect also translate into taxes and fees for State and local governments. Although it is, as a State entity, exempt from local property taxes, the University in 2002 paid \$696,000 in local water, sewer and fire district fees. In addition, State income taxes withheld from the salaries of University employees totaled \$4.5 million.

The economic activity generated by URI's spending at other Rhode Island businesses (the above described "multiplier effect") also generates state and local taxes. This includes an estimated \$4.2 million in property taxes, \$2.6 million in sales taxes and \$2.0 million in state and local income tax.

VIII. Outreach

The third pillar of URI's role as a public university, along with education and research, is *outreach*. The University defines the mission of its outreach as follows:

The University of Rhode Island, Rhode Island's only Land-Grant, Sea-Grant and Urban Grant University, is committed to work in collaboration between the University and the external community. Outreach is the application of knowledge, research, education and service to engage the external community, it will result in mutually beneficial relationships and will support outreach efforts of the University of Rhode Island at the local, regional and global levels.

Teaching outreach typically involves conveying useful knowledge to audiences other than "traditional" undergraduate, graduate or continuing education students. *Research* outreach involves applied research on some real-world issue or problem, often for a "client" outside the University. *Service* outreach involves the practical application of knowledge acquired at the University on behalf of some external constituency or client.

Outreach can thus be thought of as a mechanism by which the value of knowledge created or acquired at URI is expanded, through its practical application in communities throughout the State.

Outreach is a vitally important element of the University's contribution to the ongoing development of the Ocean State's economy. Because it takes so many diverse forms, however, the overall economic impact of outreach (in contrast, say, to the impact of University spending) is difficult to quantify. This report therefore examines several important ways in which outreach contributes to the health of the State's economy and describes some notable examples of each.

Developing Human Resources

As discussed in Part III, the University of Rhode Island makes a major contribution to the ongoing development of the State's economy through its role as the leading provider of higher education to Ocean State residents. The University's impact on the State's human resources is not, however, limited to its role as a direct provider of higher education. URI is actively engaged as well in a variety of efforts to improve the quality of elementary and secondary education and to expand educational opportunity.

- ***GEMS-NET: Improving math and science education***

GEMS-NET (Guiding Education in Math and Science Network) is a partnership between URI and seven Rhode Island school districts aimed at strengthening science curricula and improving science teaching at the elementary school level. GEMS-NET provides teachers with a series of grade-specific kits, each representing about two months of class work. The

program also trains teachers in the use of these kits and in other aspects of teaching science effectively. The training sessions are run jointly by a senior teacher and one of about URI scientists associated with the program. The scientists also serve as mentors for teachers participating in the program.

From its inception in 1996 through the end of the 2002-03 academic year, GEMS-NET had served more than 1,100 teachers from the Warwick, North Kingstown, South Kingstown, Westerly, Jamestown, East Greenwich and Exeter-West Greenwich school districts. Collectively, these teachers received more than 60,000 hours of professional training. More than 17,000 students in the seven districts have taken courses using the GEMS-NET kits.

During the past few years, several other Rhode Island districts have also begun sending teachers for training and using the GEMS-NET kits. Several thousand students in these districts have taken courses using the kits.

- ***Helping Rhode Island's schools use technology more effectively***

While technology is not a cure-all for the problems of elementary and secondary education, it can provide valuable tools for teaching and learning. The Rhode Island Teachers and Technology Initiative (RITTI) was created in 1997 by the Rhode Island Department of Education, URI and the Rhode Island Foundation, with the goal of helping the State's schools use information technology more effectively. In the summer of 2001, RITTI conducted an intensive seven-day training program for 28 local school district superintendents and 65 principals. The program focused on helping the participants develop district- and school-level technology plans. Continuing support was provided to the superintendents and principals during the 2001-02 school year and afterward.

RITTI's Model Classroom Initiative similarly worked with 145 teachers from twenty Rhode Island schools to create "technology-rich learning environments" in their classrooms, with the goal of having other teachers and other schools replicate what the group was doing.

URI faculty also partnered with local schools and teachers in a program called Preparing Tomorrow's Teachers to Use Technology, or PT3. Faculty members worked with teachers from kindergarten through high school to develop new technology-based components of regular courses. This partnership not only helps teachers improve their teaching methods, it also provides valuable insights that can be used to strengthen teacher preparation programs at URI.

Improving Rhode Island's Health

The health of Rhode Island's people affects the State's economy in several ways. Healthy workers are more productive and less likely to suffer a loss of income due to illness. Keeping people well reduces the burden of health care costs on families, employers and taxpayers – and thus helps make the Ocean State more competitive. Programs that help

make the delivery of medical care more cost-effective can similarly improve the environment for economic growth.

- ***The Cancer Prevention Research Center***

Medical science has in recent years made great progress in treating cancer. But the most effective way to deal with this most dreaded of diseases is still to prevent its occurrence.

It has long been recognized that avoiding high-risk behavior (such as smoking) is one of the keys to preventing cancer. Since its founding in 1978, the Cancer Prevention Research Center has developed highly effective techniques for reducing high-risk behaviors, using interactive computer technology. The Center has developed specific programs dealing with smoking, alcohol abuse, exercise, diet and stress management.

Rhode Island residents typically account for about half of all participants in the development, testing and use of the Center's programs. The Center estimates that its programs reach 20,000 to 30,000 Rhode Islanders each year.

Recent research estimates that successfully getting someone to reduce two risk behaviors will reduce his or her future medical costs by \$2,000 per year. If we assume an average additional life expectancy of 35 years for adult users of CPRC's programs, we can estimate that for every 1,000 State residents who successfully reduce their risk behaviors through the use of these programs, families, communities, business and government in Rhode Island can effectively avoid \$70 million in future health care costs.

CPRC is thus not only a leading center for expanding our knowledge of how to prevent cancer – it is a highly effective mechanism for translating that knowledge into tangible benefits, both human and economic, for the Ocean State. The returns to the State from the Center's activities are even more striking when we take into account the fact that State funds account for only about 2 percent of its \$5 million annual budget. Since its founding, the Center has brought more than \$60 million in federal grant funding to Rhode Island.

- ***Medication Education Resource Center***

As prescription drugs have taken on greater and greater significance – both as a means for preventing and treating illness and as a source of growth in health care spending – the importance of patients' knowledge of medication management has risen as well. At the same time, however, mail-order delivery and drive-through pick-up of prescription drugs are limiting opportunities for communication between pharmacists and patients.

In response to this dilemma, the URI College of Pharmacy's Medication Education Resource Center conducts patient education programs in communities throughout the State, at a wide variety of sites, such as community centers, senior centers, libraries, and public housing and senior housing projects. These programs feature both group sessions and individual counseling on topics such as the purpose of various medications, proper dosing, the importance of maintaining drug regimens, interactions with over-the-counter medicines,

etc. In 2002, the College of Pharmacy provided this service to more than 6,000 people in 35 Rhode Island cities and towns.

Conserving Environmental Resources

In few other states is the importance of common resources to the State's economic health as evident as it is in Rhode Island. Narragansett Bay, for example, is simultaneously a critical component of the State's natural environment and one of its most valuable economic assets. Professors Andrada Pacheco and Timothy Tyrrell of URI's department of Natural Resource Economics have estimated that in 1997 the value added to Rhode Island's economy by the Narragansett Bay ecosystem totaled \$2.3 billion.¹² Other resources held in common, such as the State's ocean waters and public open space, also make important contributions to the State's economy. Protecting these resources is essential to the maintenance of Rhode Island's economic health.

- ***Watershed Watch***

The University of Rhode Island's Watershed Watch is a statewide program that recruits, trains, assists and supervises citizen volunteers who regularly monitor the quality of surface waters in Rhode Island's lakes, ponds, reservoirs, rivers, streams, bays and ocean. Each volunteer is assigned a particular site, from which he or she collects samples for one or two hours, once each week from April through October; these samples are then delivered to URI for analysis.

Founded in 1998, URI Watershed Watch had by 2003 grown to include more than 250 volunteers, regularly monitoring nearly 200 sites in 28 Rhode Island cities and towns, as well as North Stonington, Connecticut. URI's Department of Natural Resource Science, which manages the program, estimates that volunteers contribute an average of 63 hours to the program each year. Measured by the value of the volunteers' time, the program represents a contribution of approximately \$200,000 annually to communities throughout the State.

In terms of its contribution to protecting Rhode Island's common resources, however, the value of Watershed Watch could be much greater. Over the years, Watershed Watch volunteers have helped the State Department of Environmental Management identify water quality problems in ponds, lakes and streams throughout the Narragansett Bay watershed, and in some cases have helped identify specific sources of these problems. The information that Watershed Watch provides thus allows DEM and local communities to undertake the clean-up and enforcement actions needed to protect the State's waters.

- ***The Aquidneck Island Partnership***

If Watershed Watch represents a successful grass-roots approach to protecting the State's waters, using individual volunteers, the Aquidneck Island Partnership exemplifies efforts to

¹² Pacheco and Tyrrell, The Economic Value of Narragansett Bay. A Review of Economic Studies, April 2003. <http://www.ci.uri.edu/Projects/PNB/Chafee-HUD/Pacheco%20and%20Tyrrell%20Final.pdf>

manage natural resources more effectively through the collaborative efforts of local agencies and organizations.

Aquidneck Island's prosperity is closely linked to its natural assets, but it is also subject to increased development pressures. To help manage these pressures, URI's Coastal Resources Center helped organize the Partnership, an alliance of local organizations that works with the Aquidneck Island Planning Commission. The Partnership has formulated a vision for the island that encompasses the preservation of "a livable landscape" and an economic development strategy based on low-pollution industries, sustainable tourism, agriculture and the maritime trades. CRC has worked with members of the Partnership on projects that include identification of privately-held land that should be acquired and preserved, development of part of a planned island-wide bike trail, and analysis of the economic value of public open space.

- ***The Partnership for Narragansett Bay***

The Partnership for Narragansett Bay, created in 2000, seeks to achieve goals similar to those of the Aquidneck Island Partnership but aims to do so by forging a high-level consensus at a regional level. The Partnership has focused on the development of a comprehensive approach to ensuring the future of the Bay and the State's coastal waters. Its purpose, as articulated in a vision statement published in 2003, is "to assure a healthy economy while sustaining the unique cultural and natural environments that...make this region such a special place to live."

URI's Coastal Resources Center helped organize the Partnership and provides its staff support. Through a broad-based process of consultation, CRC has formulated a strategy for protecting the Bay, its watershed and the surrounding coastal waters, organized around the following goals:

- "Economic development that conserves our soul;"
- Restoring fish and shellfish populations;
- Expanding public access;
- Protecting natural landscapes;
- Promoting stewardship and community engagement.

The Partnership's program also lays out specific strategic objectives for the growth of the maritime industry, promoting "heritage tourism," expanding areas open to shellfishing, providing access to the islands in Narragansett Bay, developing new waterfront trails, etc.

The Partnership is now working to secure commitments from the governors of Rhode Island, Connecticut and Massachusetts to support its strategy.

Helping Rhode Island Businesses Compete

Since the creation of the land grant college system in the nineteenth century, the application of practical knowledge to the needs of agriculture and industry has been central to the mission of America's public university. Today, working both with industry groups and individual businesses to help Rhode Island companies become more productive and more competitive is still a major purpose of URI's outreach programs.

- ***Reducing pollution and improving productivity***

For many Rhode Island companies, finding cost-effective ways to control pollution and manage wastes is an essential part of improving productivity and competitiveness. The URI Center for Pollution Prevention and Environmental Health helps companies do so. Among its goals is:

....to reduce costs and create economic opportunities for Rhode Island industry while at the same time eliminating pollution through chemical engineering-management strategies that include chemical substitution (green chemistry), materials recycling, improved management practices and process changes.

Founded in 1987, the Center has worked with more than 100 companies in the metal working and finishing, textile, chemical manufacturing, food processing and auto body industries. For a Cranston-based metal finishing company, for example, consultants from the Center designed a "closed-loop" system for recycling water used in the finishing process. The process was so effective that it enabled the company to give up its discharge permit, and to reduce water consumption as well. The Center's activities are financed primarily by the state Department of Environmental Management, and by the federal Environmental Protection Administration.

While the changes recommended by the Center's consultants often involve some up-front cost, the Center's research shows that these costs are usually recouped within one to three years through reductions in operating costs. The Center estimates that direct savings at client companies have totaled \$5 million over a ten-year period. They believe that the program's real benefit is significantly greater, however. Without the pollution-reduction solutions recommended by the Center, some client companies would not have been able to remain in business. The adoption of new pollution-control strategies by Center clients, moreover, can encourage other Rhode Island companies to do likewise. This, in effect, multiplies the impact of the Center's activities.

- ***Supporting Rhode Island's textile and fashion industries***

Textiles and apparel are among Rhode Island's oldest industries. In addition to providing a steady stream of graduates who are equipped with the skills these industries need, URI's Department of Textiles, Fashion Marketing and Design supports local textile and apparel companies in other ways as well. The Department operates a textile testing laboratory,

which offers companies to test their products against a variety of performance and technical standards.

The Department also offers specialized training seminars for the employees of individual companies. These seminars, which deal with topics such as basic textile science, testing, color science, dyeing and finishing, can be held either at the URI campus or at company facilities. Through the College of Continuing Education, the University also offers two “Master Seamstress” programs for fashion designers and other apparel workers.

- ***Supporting commercial fisheries and aquaculture***

Commercial fishing – for shellfish, finfish and lobster – has long been a mainstay of the Rhode Island economy. As of 2001, there were approximately 4,500 active commercial fishing licensees in the State.

URI’s Fisheries Extension program works with fishermen and fishing industry groups to maintain the health of the State’s fisheries. The program seeks to better understand – and if possible to reverse – the decline in fish populations in the waters around Rhode Island. URI scientists, for example, have participated in efforts to rebuild Narragansett Bay’s lobster population. These efforts have included “habitat restoration” – enhancement of conditions on the bay bottom that support the survival and growth of young lobsters, by constructing several artificial reefs – and restocking the area by “seeding” it with thousands of hatchery-born lobsters.

This project also has an important research component. Lobsters released into the bay are tagged and monitored in order to develop a better understanding of how hatchery-born lobsters can be prepared more effectively for release and of conditions that affect their survival and growth.

The Extension Service also provides short-term practical training for commercial fishermen. Topics include vessel safety, the use of commercial fishing gear and how to avoid entanglement of endangered species.

A New Home for Rhode Island’s Fishing Industry

In December 2003, URI’s partnership with the State’s fishing industry reached a new stage, with an agreement by the College of the Environment and Life Sciences and five industry organizations to establish the Rhode Island Commercial Fisheries Center, to be located on the University’s campus. The Center will include offices for the five organizations – the Ocean State Fishermen’s Association, the Rhode Island Commercial Fishermen’s Association, the Rhode Island Lobstermen’s Association, the Rhode Island Seafood Council, and the Rhode Island Shellfishermen’s Association – as well as meeting rooms and other facilities. It will provide a focal point for collaboration between URI researchers and the industries, as well as programs for and services to commercial fishermen.

The University is leasing an existing building to the five associations for \$1 a year. The associations will finance the renovation and fit-out of the Center.

Under the Sea Grant Industrial Fellowship program, URI graduate students are also assigned to help specific companies resolve significant problems. In 2002, for example, a doctoral student at the Graduate School of Oceanography was assigned to work with SubChem Systems, Inc., of Jamestown to develop an automated device for detecting the presence of fecal contamination in marine waters.

As an industry, aquaculture in Rhode Island is still in an embryonic State. Nevertheless, given the depletion of natural fishing stocks, aquaculture still has the potential to play a vital role in the future of Rhode Island's fisheries. URI has provided ongoing support for the development of aquaculture in Rhode Island. URI's Sea Grant program has sponsored a variety of applied research projects, aimed at helping solve some of the practical problems that aquaculture ventures face. Building on this work, the University in 2003 opened the new Blount Aquaculture and Marine Biotechnology Laboratory on its Narragansett Bay Campus. Sea Grant has also published several works for the industry – for example, a how-to guide for aquaculture start-ups; and the University also hosts an annual Rhode Island Aquaculture Conference.

The Value of Outreach

As noted above, the aggregate impact of URI's outreach activities cannot easily be quantified. Yet even from this brief survey, we can draw some conclusions about the significance of outreach programs.

Outreach appears to be an effective way to extend the impact of the University's accumulated knowledge – its intellectual capital – to communities throughout the State. The Medication Education Research Center, for example, provided patient education and counseling services in 35 cities and towns. Watershed Watch operates in 28 cities and towns. The Rhode Island Teachers and Technology Initiative supported superintendents' efforts to use technology more effectively in twenty local school districts. A more detailed review of URI's hundreds of outreach activity would provide many more examples of programs that are similarly statewide in their reach.

Outreach similarly spans a wide range of industries – from traditional Rhode Island sectors such as farming, fishing and textiles to emerging sectors such as environmental biotechnology. It can help firms in older industries remain competitive – promote the growth of new, emerging industries – and thus help maintain the diversity of the State's economy.

While some URI outreach activities are short-term projects, the majority represent long-term partnerships between the University and various industries or communities. These long-term partnerships are particularly well-suited to strategies of “continuous improvement” – an approach that can be applied not only to the goal of making a metal-working firm more competitive but also to raising the performance of urban school districts, or to long-term improvements in water quality.

Finally, it is worth noting that many of URI's outreach activities are financed from external funds. Federal funds, foundation grants and other outside financing of outreach provides, in effect, a low-cost way for the State to multiply the impact of its own investment in the University's intellectual capital.

IX. A Look Toward the Future

As significant as URI's contribution to Rhode Island's economy is today, it could be even greater in the future.

- ***A growing demand for higher skills***

In the economy of 2014, the demand for higher-level skills – analytic and communications skills, as well as specific types of technical knowledge – will be even greater than it is today. Cities, states and regions that can provide people with these skills are likely to prosper; those that can't won't.

As the leading provider of college-educated entrants into the State's work force, URI will play a critical role in determining whether Rhode Island has a work force that is prepared for tomorrow's economy.

- ***A growing demand for lifelong learning***

As noted in Part III, higher education is not confined to young adults working full-time toward their first degrees. In a rapidly changing economy, staying competitive – for individuals, communities and states alike – requires lifelong learning. As a public university, URI has an especially important role to play in ensuring that Rhode Islanders, throughout their working lives, have the opportunity to acquire (at reasonable cost) the skills and knowledge they need.

- ***Good places to live and work***

As the Rhode Island Economic Policy Council has recently pointed out, the quality of places to live and work that the State offers are among its greatest assets. As Part VIII of this report illustrates, URI has been a major participant in efforts to protect and enhance the resources that help make the Ocean State so attractive, such as Narragansett Bay, the coast and the waterfront communities. As the competition for talented people intensifies, maintaining this quality of place will become more and more important.

- ***Science and technology as keys to growth***

Many of Rhode Island's most promising opportunities for growth in the years ahead will be in industries that are built on advances in science and technology. URI's strengths in oceanography, biotechnology, environmental sciences, engineering, materials and behavioral change will be an important resource for the State.

- ***Easing the transition from lab to marketplace***

In the past, URI has not been as effective as some other universities in helping to translate the results of academic research into new businesses, new products and new jobs – in part because Rhode Island law had for many years restricted the University's ability to assist in this process. This should change with the legislature's enactment of the Public-Private Partnership Act, which will make it much easier for the University to play an active role in this process of "technology transfer" from URI to new and expanding businesses in the State.

For all of these reasons, the University has the potential to be a major contributor to the process of building a prosperous future for the Ocean State.

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