



Brown University and Rhode Island

GROWTH AND OPPORTUNITY



BROWN'S ROLE IN RHODE ISLAND'S ECONOMY: BY THE NUMBERS

- ›Brown is the seventh-largest private employer in Rhode Island, employing 3,753 people in the spring of 2005.
- ›Brown bought more than \$64 million worth of goods and services from Rhode Island firms in 2005, directly supporting 660 full-time-equivalent jobs at these companies.
- ›Brown spent more than \$52 million on construction in 2005, directly generating 470 full-time-equivalent jobs in construction and related industries.
- ›Factoring in direct University jobs, employment by Browns suppliers and contractors, spending by students and visitors, and the “multiplier effect,”
Brown directly and indirectly accounted for more than 7,500 Rhode Island jobs in 2005, and \$753 million in statewide economic output.
- ›Brown paid \$12.8 million to state and local governments in 2005 for income tax withholding, property taxes, payments in lieu of taxes, and fees.
- ›Brown spent \$144.6 million on research in fiscal year 2005—an increase of 72 percent since 1999—making Brown Rhode Island's leading center of scientific research and development. Almost all of Brown's research is funded by federal agencies or other out-of-state sources.
- ›Research spending by Brown and its partners is a major reason why Rhode Island ranked seventh among the 50 states in terms of the research-intensiveness of its economy—and why the Ocean State is well-positioned to take advantage of the opportunities that a knowledge-based economy will provide.
- ›Between 2000 and 2005, more than 22 start-up companies were created based on research conducted at Brown.
- ›During the next five years, Brown is planning to invest \$336 million in new or renovated facilities for research, teaching, and student activities. These investments will help build not only Brown's future, but that of the city and the state.

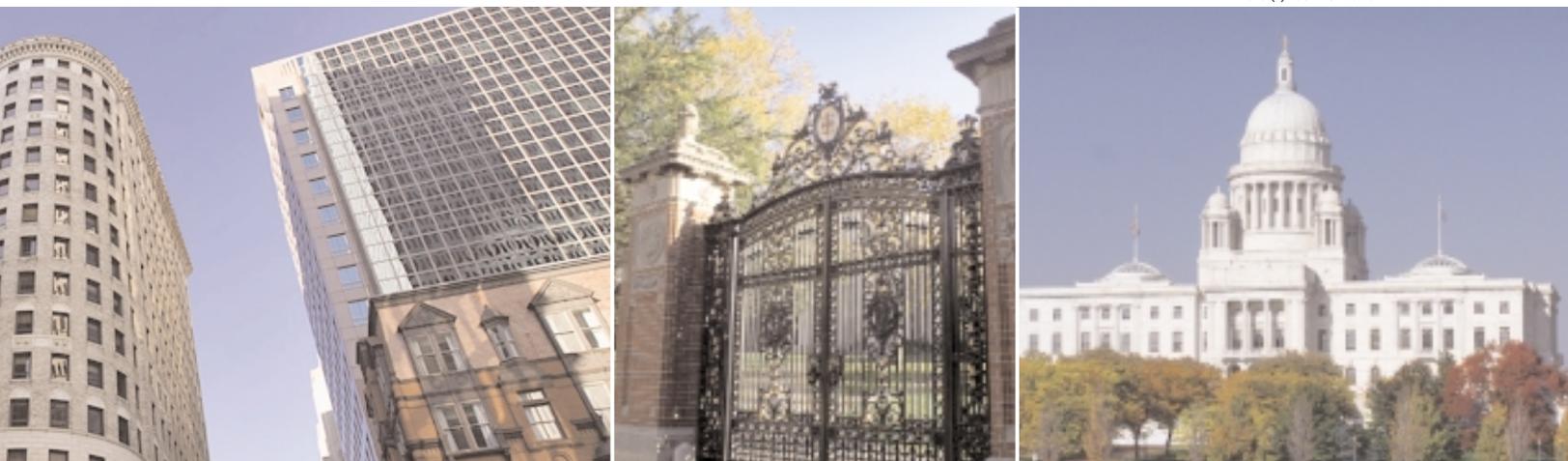


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Executive Summary

During the past five years, Rhode Island's economy has by several important measures performed better than that of the U.S. as a whole. Several factors have contributed to the Ocean State's success, including the strength of its knowledge-based industries, and the ongoing revitalization of Providence, its capital and largest city.

Brown University has been an active participant in Rhode Island's growth during this period.

- › As a major enterprise in its own right, Brown has been a partner in creating high-quality jobs in Rhode Island.
- › The University has been a partner in the development of Rhode Island's "human capital," expanding educational opportunity not only for its own students but—through its work with local school systems and communities—for other young Rhode Island residents as well.
- › As the state's leading center of scientific research, Brown has helped make the Rhode Island economy one of the most research-intensive in the country.
- › The University's investment in new facilities and programs has helped to provide the infrastructure that Rhode Island needs to support the continued growth of its knowledge-based industries.
- › The University is a partner in creation of an environment that supports innovation and entrepreneurship in knowledge-based industries, ranging from biotechnology start-up companies to community-based cultural organizations.

This report assesses the impact of Brown's involvement in all of these areas on the economic and cultural life of Rhode Island.

BROWN UNIVERSITY: A PARTNER IN JOB CREATION

- › Factoring in direct University jobs, employment by

Brown's suppliers and contractors, spending by students and visitors and the "multiplier effect," Brown directly and indirectly accounted for more than 7,500 Rhode Island jobs in 2005, and \$753 million in statewide economic output.

- › In fiscal year 2005, Brown paid \$12.8 million to state and local governments in Rhode Island—in state income taxes withheld, property taxes and payments in lieu of taxes, etc. In addition, Brown's spending on payroll, purchasing, and construction indirectly generated approximately \$19.7 million in state and local tax revenue.
- › In the spring of 2005, Brown employed 3,757—an increase of nearly 400 since the fall of 2000. Between 2000 and 2004, the University accounted for 4.3 percent of all private-sector job growth in Rhode Island.
- › In the year ending June 30, 2005, Brown bought more than \$64 million in supplies and services from Rhode Island businesses. Brown's purchases of goods and services directly supported approximately 660 full-time equivalent jobs at Rhode Island companies.
- › Brown spent \$52.7 million on University construction in fiscal year 2005—an investment that generated nearly 470 FTE jobs in construction and related industries.
- › Through the "multiplier effect," the University's spending on payroll, purchasing, and construction in fiscal year 2005 indirectly generated more than 1,800 additional jobs throughout the state.
- › Brown students spent an estimated total of \$40

million during the year for off-campus housing and on other personal needs. Applesseed estimates that this off-campus student spending, along with spending by visitors to Brown, generated more than 840 jobs throughout the state.

PARTNERS IN OPPORTUNITY

- › In the fall of 2005, 7,919 undergraduate, graduate, and medical students were enrolled at Brown.
- › More than 5,500 Brown alumni live in Rhode Island. Since the mid-1990s, the percentage of Brown students who stay in Rhode Island after graduation has grown steadily, reaching 12 percent in 2003.
- › During the past few years, Brown has initiated new graduate programs in fields such as biomedical engineering, public health, public policy, theater arts, and public humanities. These new programs help prepare students for careers in fields that are central to the continued growth of Rhode Island's knowledge-based economy.
- › Brown is working with local school systems in Providence and elsewhere to improve the quality of elementary and secondary education in Rhode Island, and to create new educational opportunities for students.

PARTNERS IN SCIENCE

- › With research expenditures totaling \$144.6 million in fiscal year 2005—an increase of 72 percent since 2000—Brown is Rhode Island's leading center of scientific research and development. Almost all of Brown's research is funded by federal agencies or other out-of-state sources.
- › Together, Brown and its hospital partners have made the Providence area a leading center for biomedical research. Federal research funds awarded to hospitals affiliated with Brown Medical School totaled \$60 million in 2004.
- › Brown is collaborating with state agencies and communities throughout the state on a wide range of research projects addressing issues critical to the Rhode Island economy – for example, the clean-up of contaminated former industrial sites.

INVESTING IN THE FUTURE

- › During the next five years, Brown is planning to invest \$336 million in new or renovated facilities for

research, teaching, and student activities. These new facilities are needed to support both the University's own growth, and the continued growth of Rhode Island's knowledge-based economy.

- › As part of its Strategic Growth Initiative, Brown has begun to expand beyond College Hill. Most significant to date has been the conversion of a former industrial building in Providence's Jewelry District into a 105,000-square-foot biomedical research center, the Laboratories for Molecular Medicine, completed in 2005.
- › Together, the Laboratories for Molecular Medicine and the new Life Sciences Building, to be completed in 2006, will increase Brown's supply of life sciences research space by 75 percent.

PARTNERS IN INNOVATION

Brown is helping in a variety of ways to maintain an environment that encourages innovation, entrepreneurship, and creativity in Rhode Island.

- › Since 2000, Brown Technology Partnerships, the University's "technology transfer" office, has helped start more than twenty new companies that are developing for commercial use new technologies first developed by University researchers.
- › Through its Entrepreneurship Program, Brown provides assistance and support to students interested in developing their own business ventures. Through the Brown Forum for Enterprise, the University also provides opportunities for aspiring entrepreneurs (both at Brown and elsewhere in Rhode Island) to connect with more established technology-based companies, venture capital investors, and others who can help them succeed.
- › Brown also plays an important role in sustaining a vibrant cultural community in Providence—through cultural activities on its own campus, partnerships with Rhode Island School of Design and Trinity Repertory Theater, and its work with a variety of grass-roots cultural programs.

BUILDING RHODE ISLAND'S FUTURE

As significant as Brown's contribution to Rhode Island's economy has been during the past five years, it will for several reasons be even greater in the years ahead.

- › Scientific research and development is likely to be

even more important in the future as a source of innovation and economic growth than it has been in recent decades. The continued growth of Brown's research enterprise—the largest in the state—will thus be critical to Rhode Island's continued prosperity.

- › “Human capital” is the single most important determinant of whether states and cities flourish or falter economically. The expansion of educational programs called for in Brown's Plan for Academic Enrichment—as well as its partnerships with other institutions and school systems throughout the state—will help ensure that Rhode Island can continue to attract, develop, and retain the talent it needs to succeed in a knowledge-based economy.

- › As part of its Strategic Growth Initiative, Brown is working closely with city and state officials to plan for the University's growth and expansion off College Hill in areas of Providence such as the Jewelry District.

Brown has in recent years been a major contributor to Rhode Island's success, and to the ongoing revitalization of Providence. It will contribute even more in the future. Brown's continued ability to contribute will be enhanced by the active cooperation and support of both the city and the state. In an era in which human and intellectual capital are the primary sources of competitive advantage, the future will belong to the communities, businesses, and institutions that learn how to collaborate most effectively.



PHOTO © WILLIAM MERCER

Introduction

Founded in 1764, Brown University has long been an active participant in Rhode Island's economic and cultural life. Today, Brown's future success depends in many ways on the continuing success of the City of Providence and the State of Rhode Island.

As the city and state become increasingly attractive places to live and work, to visit and go to school, Brown becomes more competitive in its efforts to attract the finest faculty, students, and staff. This, in turn, enables Brown to contribute even more to the city, state, and local economies. This institutional partnership has strong roots and a promising future, as the University and the city and state look for new ways to grow and improve the quality of life for the people of Rhode Island.

Brown is one of the Ocean State's largest private employers—its leading center of scientific research and development—and a generator of new businesses and new jobs. Brown Medical School is the state's only medical school; together with its affiliated teaching hospitals, it has made Providence one of the leading centers of biomedical research in the Northeast.

Great universities—like the cities and states of which they are an integral part—are constantly changing. During the past five years, Brown has been changing and growing in a number of ways that have enhanced its contributions to Rhode Island's economic and cultural life. The key to this development has been the University's adoption of a strategic Plan for Academic Enrichment, which will be funded by \$1.4 billion that it will raise through Brown's largest and most ambitious comprehensive campaign, and an evolving set of partnerships—with the City of Providence, with state agencies, with other research and educational institutions, with the private sector, and with community groups in Rhode Island.

To understand more clearly the role of these partnerships in the development of the Ocean State, the University commissioned Appleseed, an economic development consulting firm, to assist in assessing its eco-

nomical and cultural impacts in Rhode Island. This report presents the results of that assessment.

Organization of the Report

To provide a context for this assessment of Brown's impact, Part I of the report describes some of the factors that have contributed to the revival of Rhode Island's economy during the past five years and provides a brief overview of the University.

Part II assesses the University's impact on employment and job creation in Rhode Island—as a major employer in its own right, through its relationships with suppliers and contractors, and through spending by students and visitors. Part III discusses Brown's role in preparing students for the opportunities that tomorrow's economy will offer—both its own students and, through its partnerships with schools and community groups, students in elementary and secondary schools throughout Rhode Island. Part IV explores Brown's role as Rhode Island's leading center of scientific research and development.

Part V of the report briefly describes Brown's investments in the facilities needed to sustain both the University's continued growth and the continued development of Rhode Island's knowledge-based economy. Part VI examines the University's role in promoting innovation, entrepreneurship, and cultural development.

Finally, Part VII of the report briefly discusses the outlook for continued development of Brown's partnerships with Rhode Island and the City of Providence—and why the University's contributions to Rhode Island and Providence could be even greater in the future than they have been during the past few years.

ABOUT THE DATA IN THE REPORT

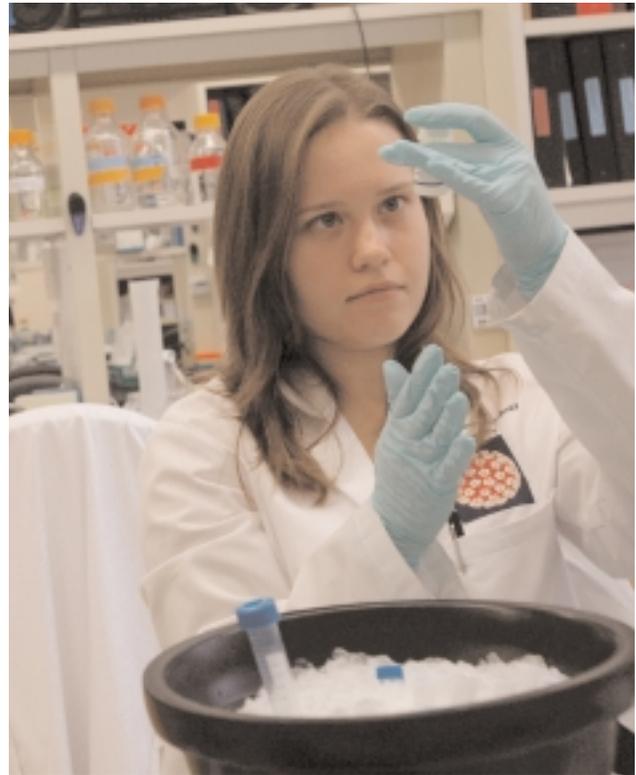
Data used in the preparation of this report came from several sources. Data on Rhode Island's economy are, except where otherwise noted, taken from data published by the Rhode Island Department of Labor and Training, the U.S. Bureau of the Census, and the U.S. Bureau of Economic Analysis. Most data on Brown's operations, revenues, and spending were provided by the University, with some data on research funding at Brown and other institutions taken from information published by the National Science Foundation and the National Institutes of Health. Other sources are cited in the end notes.



Part I: Brown in Context: Rhode Island's Knowledge Economy

By several measures, the Ocean State has prospered during the past five years; and a stronger economy has translated into new employment opportunities and higher earnings for Rhode Island residents.

- › Rhode Island fared much better than most U.S. states during the last recession. Between 2001 and 2002 the state lost fewer than 600 private-sector payroll jobs—a decline of just 0.1 percent. In the same year, private-sector payroll employment declined at the national level by 1.3 percent.
- › During the recovery that followed, Rhode Island outpaced the U.S. in creating new jobs. Between 2002 and 2004, the state added more than 7,500 private-sector payroll jobs—a gain of 2.0 percent. For the U.S. as a whole, private-sector payroll employment grew during the same period by only 0.9 percent.
- › Between 2000 and 2004, Rhode Island's gross state product grew by an average of 5.5 percent annually, compared with a nationwide average of 4.5 percent.
- › On average earnings per job, Rhode Island still trails the average for the U.S.; but the Ocean State is catching up. Between 2000 and 2004, earnings per job in Rhode Island grew by an average of 4.1 percent annually, to \$42,850; nationwide, earnings per job grew by 3.3 percent annually, to \$44,482.
- › Between 2000 and 2004, Rhode Island's per capita income grew by an average of 4.2 percent annually, versus only 2.6 percent at the national level. After lagging behind the U.S. for many years on this important measure of overall economic well-being, Rhode Island's per capita income in 2004 was \$34,180—3.4 percent higher than per capita income nationwide.



Rhode Island's strong performance since 2000 is especially notable when viewed against the background of an economy that not long ago seemed mired in decline. In the late 1980s, a severe regional recession hit the Ocean State especially hard. Between 1989 and 1992, private payroll employment in Rhode Island declined by more than 10 percent—a loss of nearly 41,000 jobs—and in Providence by nearly 11 percent. Rhode Island's manufacturing sector alone lost more than 22,800 jobs.

From 1992 through 2001, the Ocean State experienced a long, slow recovery, but lagged well behind the U.S. in total job growth. It was not until 2000 that private employment in Rhode Island returned to the level it had reached in 1989.

The Growth of Rhode Island's Knowledge Economy

What accounts for the apparent reversal of Rhode

Island's fortunes during the past five years? One reason is that since the early 1990s, the structure of the state's economy has changed in ways that make it less vulnerable to the ravages of recession. Manufacturing now accounts for less than 14 percent of all private payroll jobs in Rhode Island.

Most important, the loss of jobs in older manufacturing industries, such as textiles and jewelry, has been more than offset by growth in other sectors of the state's economy—including industries often associated with the "knowledge economy," such as professional and business services, health care, educational services, and information services.

Even in sectors that might not at first glance appear to be pillars of the knowledge economy, industry segments that are most knowledge-intensive are often those that experienced the greatest growth. In the manufacturing sector, for example, the pharmaceutical industry is the only one that has been growing in Rhode Island in recent years, adding more than 1,000 jobs between 2001 and 2004.

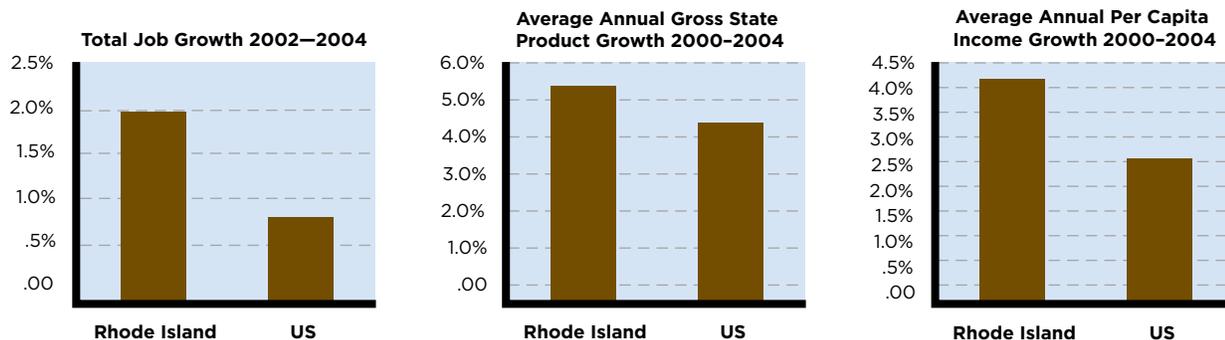
The growth of knowledge-intensive industries in Rhode Island is to some extent a reflection of certain underlying strengths. For example:

- › In 2004, according to Census Bureau estimates, 28.1 percent of all Rhode Island residents age 25 and older had at least a four-year college degree. Rhode Island ranked 16th among the 50 states on this score.¹
- › 11.2 percent of all Rhode Island residents age 25 and older also have post-graduate or professional degrees; Rhode Island ranked 10th among the 50 states.²
- › Rhode Island ranks seventh among the 50 states in terms of the "R&D-intensiveness" of its economy, measured by the ratio between total R&D spending and gross state product.³
- › Between 1990 and 1998, the number of patents awarded to Rhode Island companies, institutions, and individuals grew by 8.6 percent annually; among the states, Rhode Island ranked fourth in patent growth during this period.⁴

The improvement in the state's economy also reflects the ongoing revitalization of Providence, the state's capital and largest city. Like many other Northeastern cities, Providence in the late twentieth century suffered through decades of decline. Between 1950 and 1980, the city lost more than a third of its population. The recession of the late 1980s and early 1990s only seemed to accelerate this downward spiral. Between 1989 and 1992, Providence lost 25 percent of its manufacturing jobs, and 12 percent of its total employment base.

Since the recession bottomed out in 1992, however, Providence has enjoyed a recovery that few would then have dared to predict. Years of state and city investments in public infrastructure, downtown development projects, and open space began to pay off. Projects such as Waterplace Park and other riverfront improvements, Johnson and Wales University's downtown campus, Providence Place, and many others, along with unique cultural events such as Waterfire, helped make Providence a more attractive place to live, work, visit, and shop. The city's population began to grow again—increasing by 12 percent between 1992 and 2000, fueled by a mix of rising immigration, relatively low costs, convenient com-

Figure 1: Comparative Economic Statistics





Ruth J. Simmons, President of Brown University

The Plan for Academic Enrichment

During the past 15 years, as the nation's economy has grown more dependent on the intellectual capital and talented graduates of major research universities, Brown's role in Rhode Island—as an educational institution, innovator, and community partner—has taken on a new significance.

Recognizing the need to sustain and even accelerate Brown's growth over the next 15 years and beyond, President Ruth Simmons announced the **Plan for Academic Enrichment**, an ambitious initiative that increases the University's capacity to teach, to innovate, and to partner with Rhode Island institutions. The Plan includes 10 strategic areas of growth

and investment. Several of them are highlighted here.

- Brown is significantly increasing the size of its faculty in order to increase teaching and research capacity. One hundred new faculty positions have been created.

- The Plan promotes multidisciplinary research and education. For example, in just the past several years, the University has established the Environmental Change Initiative, the Center for Spatial Structures in the Social Sciences, the Center for Computational Molecular Biology, and the Institute for Archaeology and the Ancient World.

- Through strategic partnerships with its affiliated hospitals, Brown is enhancing clinical medical education, research, and facilities. During the next five years, Brown Medical School will seek to increase its enrollment to 400 students.

- Brown is also investing in its program in Public Health with new faculty positions and a plan for a new facility to house the program. This will allow the University to double the size of the public health student body by 2009.

- Brown continues to expand its role as a leading research university—not only through multidisciplinary collaboration within the University, but through partnerships with other institutions. Brown's partnerships with the Marine Biological Laboratory, with state agencies, with the University of Rhode Island, and with the hospitals that make up the academic medical center have already resulted in important innovations—whether measured in recent research funding, publications, invention disclosures, or jobs created from spin-off companies.

To achieve the Plan for Academic Enrichment's objectives—to house new academic programs, new faculty and students, and to provide space for new research initiatives—the University is planning significant investments in infrastructure and facilities during the next 10-15 years. This expansion plan is known as the **Strategic Growth Initiative**.

In October 2003, the Brown University Corporation adopted the *Strategic Framework for Physical Planning*—the result of a 15-month master planning study. The Strategic Framework established three principles for Brown's future physical development:

- To consolidate the core, investing in the existing College Hill campus;

- To develop circulation infrastructure in ways that connect the campus community with its partners and the city beyond College Hill;

- To move beyond College Hill in ways that help the University—and the community—prosper.

To consolidate its core, the University is developing space within its existing campus on College Hill along a new open space called The Walk that is designed to link the historic Green and the former Pembroke campus—such as the Sidney E. Frank Hall, the future home of the Cognitive and Linguistics Sciences Department and the administrative offices of the Brain Science Program; and the Creative Arts Center, a space for faculty and students to conduct interdisciplinary arts research. To connect the campus more efficiently with its partner institutions and the rest of the city, Brown—along with its affiliated hospitals and the Rhode Island School of Design—started a shuttle service linking College Hill with the downtown area, the Jewelry District, and the hospitals. The University also subsidizes the use of public transit by its students and employees.

The most significant part of Brown's Strategic Growth Initiative will be the University's expansion beyond College Hill. As Brown officials look beyond College Hill for development opportunities, they strive to achieve several key goals: to develop underutilized space, reinforce existing partnerships or establish new ones, contribute energy and resources to neighborhoods that need them, and extend the Brown experience to new, lively districts within Providence's urban center.



PHOTO COURTESY PWCVB

Since the recession bottomed out in 1992, however, Providence has enjoyed a recovery that few would then have dared to predict. State and city investments in public infrastructure and downtown development projects began to pay off, making Providence a more attractive place to live and work.

muter rail connections, and an attractive quality of life.

Providence, moreover, has been a focal point for the growth of some of Rhode Island's leading knowledge-based industries—health care, higher education, business services, and the arts. The growth of these industries has allowed the city to reinvent itself despite the continued decline of its older manufacturing industries. The continuing evolution of the city's economy is perhaps most evident in the Jewelry District. Once the hub of one of Rhode Island's leading manufacturing industries, it is fast becoming the physical nucleus of the city's life sciences research and development activities.

Brown University: Building Rhode Island's Knowledge Economy

Colleges and universities play a dual role in Rhode Island's economy.

- › Higher education is in itself one of the state's largest knowledge-economy industries. Together Rhode Island's public and private colleges and universities⁵ employed approximately 14,000 people in 2004—more than were employed in the banking industry, or in the information and communications sector.
- › Higher education is also a vital part of the infrastructure that supports the continued growth of other leading sectors of Rhode Island's new economy. Colleges and universities provide the steady stream of graduates required by employers in health care, professional services, information technology and services, technology-based manufacturing, and other growth industries. Universities are an important source of the new ideas, discoveries, and inventions that feed the growth of the knowledge economy. And universities are increasingly involved in the process of "technology transfer" that turns new knowledge into new businesses and jobs.

Brown University—the state's oldest educational institution—exemplifies this dual role particularly well.

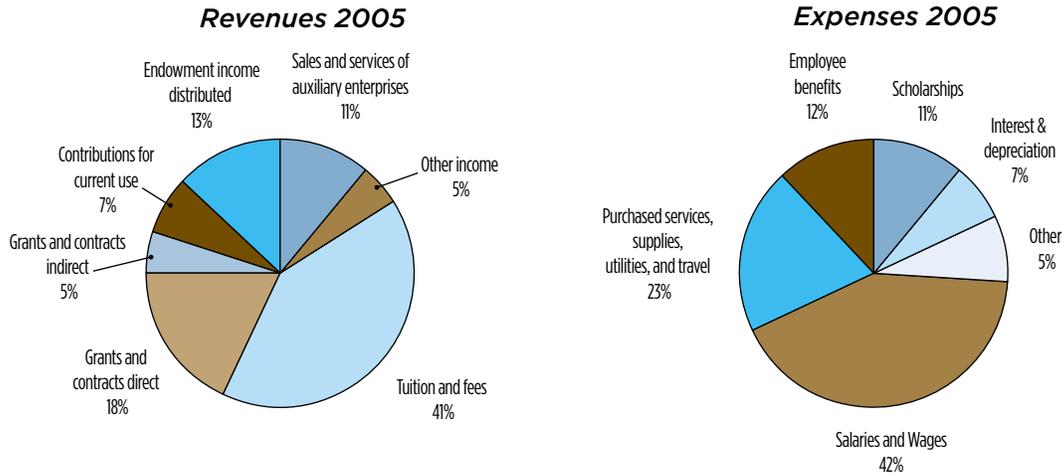
- › Brown is by several measures the state's largest educational enterprise. It ranks first among Rhode Island colleges and universities in total revenues and expenditures, and first in the number of people it employs. It is not only one of the state's largest knowledge-based enterprises, but during the past five years has also been one of its fastest-growing.
- › Brown is Rhode Island's leading center of scientific research and development, and a leading source of new technology-based companies. Its undergraduate and graduate programs prepare students to work in a number of fields that are vital to the growth of the state's knowledge economy.

Brown University today includes three major divisions:

- › **THE COLLEGE** is Brown's undergraduate school. Undergraduate enrollment of full-time students in the fall of 2005 totaled 5,833. In addition to a full range of programs in the liberal arts and sciences, Brown offers undergraduate degrees in education and engineering.
- › **THE GRADUATE SCHOOL** offers programs of study leading to advanced degrees in fields as diverse as American studies and applied mathematics, classics and computer science, music and materials science. In the fall of 2005, 1,736 students were enrolled in graduate programs at Brown.
- › **BROWN MEDICAL SCHOOL**, which granted its first medical degrees in 1975, is Rhode Island's only medical school. Enrollment in the fall of 2005 totaled 350.

Brown's programs of education and research extend beyond its own campus. Brown Medical School's partnership with seven Rhode Island hospitals is

Figure 2: Revenues & Expenses by Category, FY 2005



essential both to the education of physicians and to Brown's role as a center of biomedical research. Partnerships with the Rhode Island School of Design, Trinity Repertory Company in Providence, and the Marine Biological Laboratory in Woods Hole similarly strengthen Brown's programs in the arts and life sciences. And partnerships with the affiliated hospitals and community health centers, the State Department of Health, and other public agencies are integral to Brown's approach to teaching and research in public health—the newest and fastest-growing of the University's major programs.

Brown's operating revenues for fiscal year 2005 totaled more than \$586.3 million—an increase of 8.2 percent over its total revenues for 2004. As Figure 2 shows, tuition and fees represented the single largest source of revenue (41 percent of the total). Other major sources included contracts and grants (23 percent of all revenue) and endowment income (13 percent).

Salaries and employee benefits accounted for 54 percent of the \$587.1 million that Brown spent on University operations in fiscal year 2005; purchases of supplies, services, and utilities for 23 percent, and student financial aid for 11 percent.

In assessing Brown's role in Rhode Island's economy, however, it matters not only how the University finances its operations and what it spends money on, but where its revenues come from and where they are spent. Overall, we estimate that nearly 90 percent of Brown's revenues are derived from out-of-state sources—and that 67 percent of all University spend-

ing occurs within the state. From Rhode Island's perspective, Brown is in effect a major "export" business, in the sense that it "sells" its educational and research services to out-of-state "customers" (out-of-state students, federal agencies, etc.), collects revenue from them—and then spends most of that revenue within the state.

Put another way, for every dollar the University collects from in-state sources (tuition paid by Rhode Island residents, state government grants and contracts, etc.), it spends more than \$5.60 within the state on payroll, purchases from local businesses, financial aid for Rhode Island students, etc.



PHOTO © WILLIAM MERCER

Part II: Partners in Job Creation

Brown University has been an active partner in efforts to create high-quality jobs in Rhode Island. Brown contributes to this effort in several ways. The University is itself a major—and growing—employer.

Through its purchasing from Rhode Island businesses and its construction projects, it also supports employment in a wide range of businesses, both in Providence and elsewhere in the state. Moreover, through the “multiplier effect,” in-state spending by University employees, and by the companies with which the University does business, also generates thousands of jobs in Rhode Island.

Taking into account employment at Brown, jobs generated by University spending on goods, services and construction, and jobs generated by student and visitor spending, Brown directly or indirectly accounted for more than 7,500 Rhode Island jobs in 2005—equal to approximately 1.6 percent of all wage and salary employment in the Ocean State.

A Leading Rhode Island Employer

In the spring of 2005, Brown employed 3,757 people in jobs ranging from full professors and Ph.D.

Figure 3: Occupational Distribution of Brown University Employment, 2005

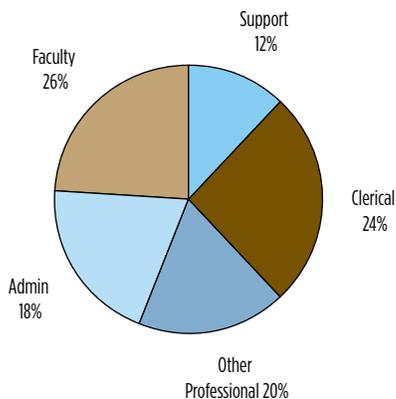


PHOTO © CHRIS VACCARO



PHOTO © JOHN ABROMOWSKI

We estimate that the \$64.3 million Brown spent on in-state purchases of goods and services in fiscal year 2005 generated 663 full-time-equivalent jobs throughout the state.

researchers to professional administrative staff, clerical workers and lab technicians, to facilities management staff, security guards and food service workers. In addition to these full- and part-time employees, Brown employs hundreds of people in a variety of temporary positions, including clerical and maintenance workers. In fiscal year 2005, wage and salary payments to Brown employees totaled \$237.4 million.

In 2004, Brown University was the seventh-largest private employer in Rhode Island. Brown is, moreover, a growth enterprise; between 2000 and 2005, regular employment at Brown grew by 11.6 percent—a gain of nearly 400 jobs. During the same period, payroll employment in Rhode Island grew by only 2.3 percent—and in Providence, employment declined by 4.9 percent.⁶ During this period, the University by itself accounted for 4.3 percent of all private-sector job growth in Rhode Island.

In 2005, 31 percent of Brown’s regular employees—approximately 1,165 people—lived in Providence. More than half (53 percent) lived in other Rhode Island communities, and 16 percent lived outside the state—the majority of them in southeastern Massachusetts.

WORKING AT BROWN: SALARIES AND BENEFITS

Brown is notable not only for the number of people it employs, but for the quality of the jobs it offers. The median salary for all full-time employees in fiscal year 2005 was \$44,437—14 percent higher than the median for all full-time workers in Rhode Island.⁷ Average earnings for various groups of employees are shown below in Table 1, along with median earnings for all Rhode Island workers in comparable categories.

Brown provides a full range of employee benefits including medical and dental insurance, life insurance, flexible spending accounts, retirement savings programs, long-term disability coverage, and employee loans of up to 20 percent of base salary. Brown has also negotiated with Countrywide, Washington Mutual, and Liberty Mutual to provide discounts to its employees on mortgages and on homeowner and auto insurance, and has similarly negotiated discounts for its employees with a number of local retailers.

To help its employees finance the cost of higher education for their children, Brown developed a program, the **TUITION AID PROGRAM FOR DEPENDENT CHILDREN (TAP)**, which pays a maximum of \$10,000

Table 1: Average Full-time Salary by Occupational Category

Occupational Category	Average Salary for Full-time Employees	RI Occupational Category	RI Median Wages, 2004
Faculty	\$88,205	Life, Physical & Social Science Occupations	\$45,063
Administrators	\$75,545	Management Occupations	\$68,960
Other professionals	\$48,646	Education, Training & Library Occupations	\$35,599
Clerical/technical	\$30,512	Office & Administrative Support Occupations	\$25,189
Support staff	\$39,735	Building & Grounds Maintenance Occupations	\$19,128

per academic year for up to four years for each dependent child pursuing a degree at an accredited institution. In 2004, 324 dependents of employees utilized the TAP at a cost to the University of \$2,410,227.

INVESTING IN EMPLOYEES

Brown offers its employees extensive opportunities for education and training—not just for themselves, but for family members as well. While the specifics of the program vary by employee class, in general the Employee Education Program pays for:

- › Three degree or job-related courses per year at Brown;
- › Reimbursement of up to \$2,500 per year for the cost of courses at other accredited institutions; and
- › Unlimited courses through the Brown Learning Community (the University's continuing education program).

During the fiscal year 2004-05, 251 employees used the EEP to take 472 courses at Brown and at other institutions, at a cost to the University of \$491,276.

Brown offers a variety of University-wide learning and development opportunities to staff. These include ESL, supervisory development training, computer education, and departmental financial and grant management training. In the 2004/2005 academic year, 1,234 employees participated in one or more of the human resources and computer education training programs.

By investing in the skills of its employees, the University is of course helping itself. But because a more productive work force also helps Brown compete for talent and for research funding, such investment also helps build both the state's and the city's economies. Moreover, while many Brown employees stay at the University for many years, some move on



PHOTO COURTESY PNCVB

to jobs with other institutions or companies in Providence, or elsewhere in Rhode Island. By providing a broad array of education and training opportunities, Brown is not only enhancing the skills and productivity of its own work force—it is making a long-term contribution to the growth of Rhode Island's human capital base.

Purchasing and Construction

Brown University spent more than \$243 million in fiscal year 2005 on purchases of goods and services, and on construction. Brown's spending on goods and services generates business for Rhode Island companies and jobs for Rhode Island residents. Its investment in construction does the same. Overall, Appleseed estimates that University spending on goods, services, and construction directly supported more than 1,100 full-time-equivalent jobs at Rhode Island companies in fiscal year 2005.

In fiscal year 2005, Brown spent \$190.5 million on purchases of goods and services (other than construction). Purchases from Rhode Island companies totaled \$64.3 million—34 percent of all University



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In 2004, Brown University was the seventh-largest private employer in Rhode Island. Brown is, moreover, a growth enterprise; between 2000 and 2004, regular employment at Brown grew by 11.6 percent—a gain of nearly 400 jobs.

Table 2: Brown University Spending by Location of Vendor, 2005

Brown's Spending by Location of Vendor, FY 2005	TOTAL	Percent Paid to Rhode Island Companies	Dollars Paid to Rhode Island Companies
Goods & Services	\$ 190,462,419	34%	64,259,298.19
Construction	\$ 52,723,718	75%	39,526,277.18
TOTAL	\$ 243,186,138	43%	103,785,575.37

Totals may not sum due to rounding

spending on supplies and services. Much of this in-state spending is concentrated in Providence; businesses based in the city accounted for nearly 72 percent of all in-state purchasing.

Rhode Island businesses from which the University buys goods and services include such large firms as E. W. Burman, Blue Cross Blue Shield of Rhode Island, New England Gas Co., Delta Dental of Rhode Island, and Sarra Engineering, as well as smaller firms like Gold Pest Control, Adlers Hardware, Angelica Linen Service, Lotus Landscaping, Mercury Print & Mail, Guy Abelson Catering, Computopia, and the local Dunkin' Donuts franchise.

University purchases of goods and services directly support jobs in these and other Rhode Island companies. Appleseed estimates that the \$64.3 million Brown spent on in-state purchases of goods and services in fiscal year 2005 generated 663 full-time-equivalent jobs throughout the state.

Brown spent \$52.7 million in fiscal year 2005 on construction and renovation of University facilities, of which \$39.5 million was paid to Rhode Island-based contractors. Appleseed estimates that in 2005 University construction directly generated a total of 468 full-time-equivalent jobs in construction and related industries.

Indirect and Induced Effects

Brown's impact on the Rhode Island economy goes beyond the direct impact of its spending on payroll, purchasing, and construction to include "indirect and induced effects." Rhode Island companies from which the University buys goods and services use some of the money they earn from Brown to buy goods and services from other local businesses; those businesses in turn buy some of what they need from still other Rhode Island companies. Similarly, Brown's employees (and the employees of its Rhode Island-based suppliers) spend part of their take-home pay locally—for housing, utilities, food, child care, entertainment, and other routine household needs.

The \$64.3 million that Brown spent on a broad array of purchases from Rhode Island businesses in fiscal year 2005, and the \$39.5 million spent on con-

Table 3: Statewide Direct, Indirect & Induced Impacts of Purchasing and Payroll Spending

TOTAL	Output	Employment
Direct	\$ 234,914,720	2,071
Indirect	\$ 43,480,232	351
Induced	\$ 44,109,505	522
Total	\$322,504,457	2,944



PHOTO © PWCVB

Factoring in direct University jobs, employment by Brown's suppliers and contractors, spending by students and visitors, and the "multiplier effect," Brown directly and indirectly accounted for more than 7,500 Rhode Island jobs in 2005, and \$753 million in statewide economic output.



the spending on payroll, purchasing, and construction—and the spending by University employees and in-state suppliers that University spending made possible—generated 2,944 full-time-equivalent jobs throughout Rhode Island in FY 2005, and over \$322 million in statewide economic output.

Table 4: Statewide Direct, Indirect & Induced Impacts of Student Spending

TOTAL	Output	Employment
Direct	\$ 40,093,933	447
Indirect	\$ 8,031,334	70
Induced	\$ 6,171,459	67
Total	\$54,296,726	583

Totals may not sum due to rounding

STUDENT AND VISITOR SPENDING

Brown University also impacts the economies of Rhode Island and Providence by attracting students and visitors from around the country and the world. Spending by students and visitors supports employment in local industries such as restaurants, hotels, and local shops.

STUDENTS

Brown enrolled 7,931 undergraduate and graduate students in the 2004-05 academic year, and 1,175 students during the summer. Students living in a dormitory or Brown-owned apartment are estimated to spend an average of \$2,510 on miscellaneous personal expenses. To calculate the impact of summer students, it was assumed that summer students would spend a quarter of the academic-year budget.

Based on the assumptions outlined above, Appleseed estimates that in fiscal year 2005, spending by Brown students totaled more than \$40 million.

As with spending by the University itself, money spent by Brown students generates economic activity and jobs in Rhode Island, both directly and indirectly. Appleseed estimates that student spending generated \$54.3 million in statewide economic output in fiscal year 2005, and 583 full-time equivalent jobs.

VISITORS

Like the University and its students, visitors to Brown spend money while they are in Providence that generates economic activity and jobs in Rhode Island.

struction, directly accounted for 1,131 full-time equivalent (FTE)⁸ jobs with vendors and contractors throughout Rhode Island.

Similarly, University employees living in Rhode Island spend part of their take-home pay—a total of approximately \$131.1 million⁹ in disposable income—within the state; this spending directly supports approximately 940 FTE jobs.

As noted above, direct spending on payroll, purchasing, and construction also generate “indirect and induced” or “multiplier” effects. As Table 3 shows, the indirect and induced effects generated by Brown’s direct spending on payroll, purchasing, and construction in fiscal year 2005 totaled \$87.6 million in statewide economic output, and approximately 873 FTE jobs.

Thus, the direct, indirect, and induced effects of

PHOTO COURTESY PIVCUB

Table 5: Student Spending

Student Spending	Students	Student Costs	Total
On-Campus Academic Year	4,843	\$ 2,510	\$ 12,155,930
Off-Campus Academic Year	3,088	\$8,660	\$ 26,742,080
On-Campus Summer	935	\$ 628	\$ 586,841
Off-Campus Summer	240	\$ 2,540	\$ 609,082
TOTAL			\$ 40,093,932

Totals may not sum due to rounding

During fiscal year 2005:

- › 41,412 prospective students and their parents toured the Brown campus.
- › An estimated 10,000 parents, relatives, and friends attended Commencement ceremonies.
- › 3,011 parents came to Brown for Parents Weekend.
- › Brown's departments booked hotel rooms for 1,693 academic visitors.
- › More than 98,000 people attended athletic events at Brown.

The impact of these groups varies. By definition, all of those for whom University departments book hotel rooms are out-of-town overnight visitors. And with many students coming to Brown from outside Rhode Island, it is reasonable to assume that a great majority of prospective students who visit the campus, Commencement guests, reunion alumni and participants in Parents Weekends are similarly from out of town. The majority of those attending athletic events at Brown, in contrast, are assumed to be members of the University community; it is assumed for purposes of this analysis that only 10 percent are out-of-town visitors.

Assuming that they stay an average of two days in Providence, it is estimated that local spending by out-of-town visitors totaled approximately \$13.3

million in fiscal year 2005. Therefore, it is estimated that this spending generated 216 direct jobs and an additional indirect and induced 43 jobs in Rhode Island.

Putting It All Together: Brown as a Job Generator

When the number of Brown employees is combined with the number of jobs supported by Brown's spending on supplies, services, and construction, the number of jobs generated by the spending of students, employees, and visitors, Appleseed estimates that in fiscal year 2005, Brown directly and indirectly accounted for 7,543 jobs throughout Rhode Island—1.6 percent of all wage and salary employment statewide. This equates to an estimated \$753 million in statewide economic output.

Table 6: Statewide Direct, Indirect & Induced Impacts of Visitor Spending

TOTAL	Output	Employment
Direct	\$13,308,756	216
Indirect	\$ 1,997,272	21
Induced	\$ 2,007,373	22
Total	\$ 17,313,401	259

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PHOTO COURTESY RWICVB

Table 7: Summary of Brown’s Payments to Government

TAX PAID AS AN EMPLOYER	
State income taxes withheld from salaries	\$8,392,577
Unemployment insurance taxes	\$ 497,298
TAX PAID AS AN ENTERPRISE	
Real property tax	\$ 459,920
Payments in lieu of taxes	\$1,328,536
FEES FOR STATE AND CITY SERVICES	
Narragansett Bay Commission	\$ 1,082,419
City of Providence—Water Supply	\$ 614,981
City of Providence—Police Detail	\$ 373,896
Other City fees	\$ 53,436
Other State fees	\$ 29,032
TOTAL	\$12,832,095

Payments to State and Local Governments

Despite its status as a nonprofit institution, Brown—like any other major enterprise—generates revenue for state and local governments in a variety of ways. Overall, Brown directly contributes \$12.8 million to the state and city treasuries.

- In 2004, Brown withheld \$8.4 million in state and local income taxes from the salaries and wages of its employees. In addition, the University paid nearly \$500,000 in unemployment insurance taxes.

- At the local level, the University paid \$1.8 million in real property taxes on property used for purposes not considered tax-exempt, and in payments in lieu of taxes (PILOT).

- As a user of state and city services the University paid \$2.2 million for water and sewer service as well as police protection.

In addition to these direct payments, the business activity and employment generated by the University’s purchases of goods and services, and by its employees’ routine household spending, also produce tax revenues for both state and local governments. In fiscal year 2005, economic activity generated through the multiplier effect yielded an estimated \$16.3 million in state revenues and \$4.0 million in local property taxes.¹⁰

Part III: Partners in Opportunity: Developing Rhode Island's Human Capital

Human capital—the knowledge and skills that workers accumulate through education and experience—plays a central role in determining the growth and decline of cities and metropolitan areas.

In today's knowledge- and innovation-based economy, talented workers develop new technologies, create new companies, and find ways to increase productivity in existing industries. Talented workers are the “economic raw material” of the knowledge economy.¹¹

At the same time, the prospects for individual workers are increasingly defined by the opportunities to acquire both basic and advanced skills to which they have access. In today's economy, education is the key that opens the door to a better future. Data from the 2004 American Community Survey show that the



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earnings of Rhode Island residents with four-year college degrees are more than \$12,000 greater than the earnings of those with no education beyond high school (Figure 4).

The economic benefits of higher education, however, are not limited to the graduates themselves.

Figure 4: Median Earnings for Rhode Island Residents, Age 25 and Over, by Educational Attainment, 2004

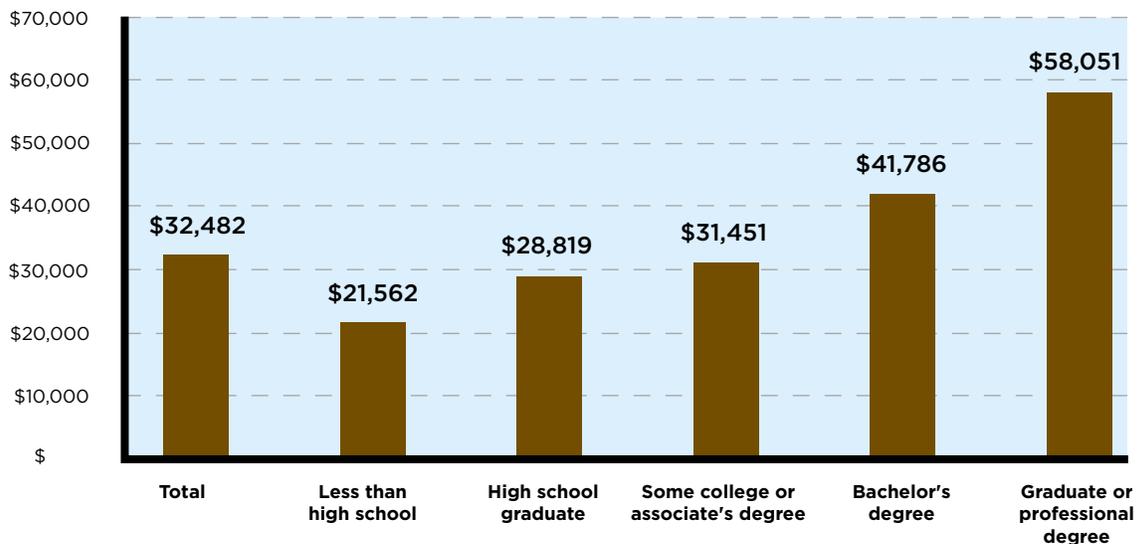




PHOTO © GETTY

Brown’s involvement in education extends well beyond its own classrooms, however; the University works directly with local school districts, teachers, parents and children to help prepare the next generation of Rhode Islanders to succeed in a knowledge-driven economy.

Higher education has important spillover effects. Studying the relationship between education and employment in metropolitan areas, economist Enrico Morretti found that a 1 percent increase in the number of college graduates in a metropolitan area increased the wages of other, less-educated workers by 1.2 to 1.9 percent.¹² When the number of better-educated workers increases, so does the overall productivity of the workforce—and the benefits of this increased productivity are widely shared.

Research by Harvard economist Edward Glaeser and others suggests that the presence of a well-educated work force is particularly critical for older cities. The depth of their reserves of human capital, Glaeser argues, explains why some cities, such as Boston, have been able to adapt successfully to the changing demands of a rapidly-evolving economy, while others have not.¹³

Through its undergraduate and graduate programs, Brown continuously replenishes Rhode Island’s pool of talented knowledge industry workers. Brown’s approach to education, moreover, is in some respects particularly well-suited to the demands of the knowledge economy. With its commitment to being a “university college,” Brown offers undergraduates opportunities for advanced learning that few other institutions can match. At both undergraduate and

graduate levels, moreover, Brown has long emphasized an interdisciplinary approach to learning. This emphasis, and the flexibility that comes with it, means that Brown is especially well-positioned to prepare students for a world in which traditional boundaries between fields of knowledge, professions, and industries are fast disappearing. Similarly, Brown’s tradition of requiring students to design—and take responsibility for—their own education is particularly valuable in an era when workers at all levels are expected to take responsibility for the development of their own human capital.

Brown’s commitment to education extends well beyond its own classrooms. The University works directly with local school districts, teachers, parents, and children to help prepare the next generation of Rhode Islanders to succeed in a knowledge-driven economy.

Students and Alumni

Major research universities act as magnets for talent, attracting out-of-state high school graduates and graduate students with the promise of a world-class education and a head start in their careers. Brown is no exception. Of the 7,919 students enrolled in fall 2005, 6,914—87 percent—came to Providence from outside the state of Rhode Island.

Table 8: Enrollment, Fall 2005, by Permanent Address and School

	Providence	Other Rhode Island	Other US	Non-US	Total
Undergraduate College•	77	220	5,025	511	5,833
Graduate School	413	122	735	466	1,736
Medical School	126	47	170	7	350
Total	616	389	5,930	984	7,919

•Undergraduate college numbers reflect full-time students.

Table 9: Current Location of Alumni, 2005

	Providence	Other Rhode Island	Other US	Non-US	Total
Undergraduate	1,369	2,658	53,751	2,346	60,124
Graduate	854	1,020	11,474	1,557	14,905
Medical School	96	241	1,796	20	2,153
Total Unique Alumni	2,035	3,508	62,769	3,525	71,837

Brown's graduate and professional programs have grown in recent years. Between 1994 and 2005, Graduate School enrollment increased by more than 29 percent and Medical School enrollment by nearly 12 percent.

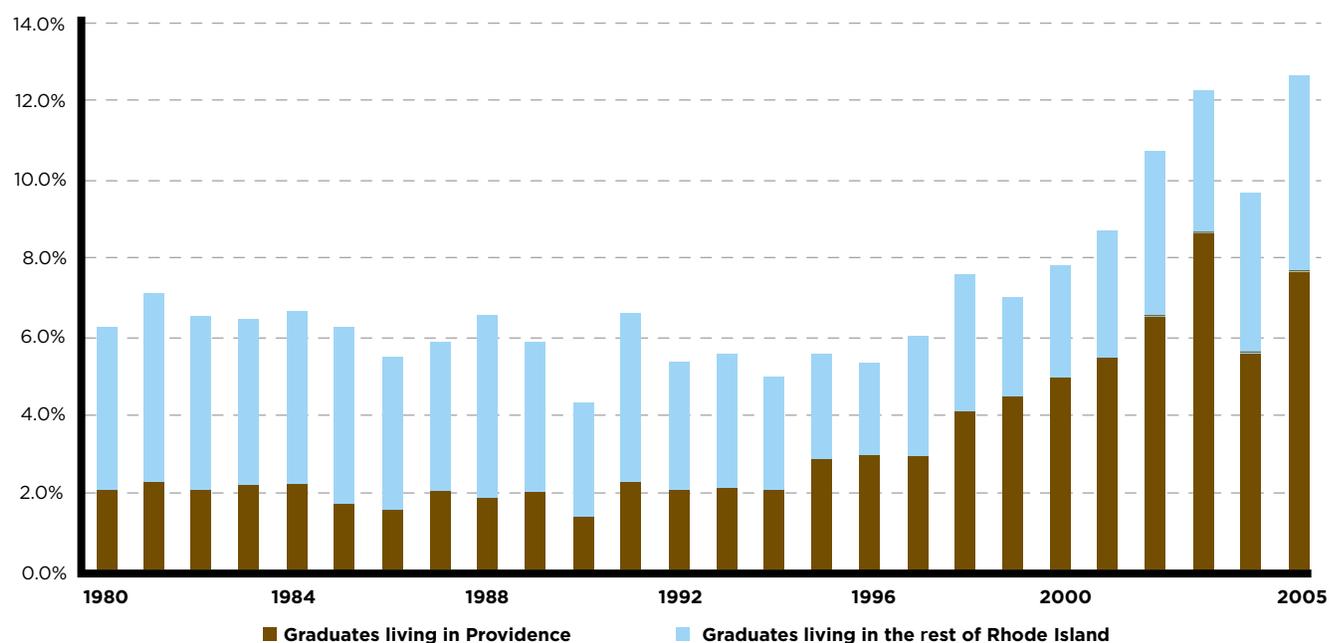
After graduating, the great majority of Brown University students leave Rhode Island to pursue opportunities elsewhere. Of Brown's 71,837 living alumni, 5,543—7.7 percent—still live in Rhode Island.

Looking only at aggregate figures for all Brown alumni, however, obscures what appears to be a significant trend. The percentage of all Brown graduates who are still living in Rhode Island has increased—from a low of about 5 percent of the class of 1990 to about 12 percent of the class of 2003 (including 8 percent who are living in Providence).

The graph (Figure 5) reflects a natural diffusion of graduates over time: Some graduates stay to continue their studies at Brown; some work for a few years before moving out-of-state. But the steep increase in the number of graduates still in Providence suggests that something else is at work: Providence is seen as an attractive place for talented young people. Moreover, as some Brown students become more involved in the life of the community beyond the campus—for example, through cultural and community service activities—they may be more likely to stay after graduation.

The slower diffusion indicates that even if Brown graduates don't stay in Providence forever, some stay a few extra years and make a positive contribution to the local economy. As urban economist Richard Florida notes:

Figure 5: Proportion of Alumni Living in Providence and the rest of Rhode Island by Graduation Year, as of September 2005



Business and Entrepreneurship

Beginning in fall 2005, Brown University undergraduates are able to study how new ventures get started, how innovative products are developed, which organizational structures and behaviors have worked in the past, and which ones have not.

Brown offers a new concentration called **Commerce, Organizations, and Entrepreneurship**. The concentration is similar to the existing Public and Private Sector Organizations concentration, but focuses its attention increasingly outside the University. The program offers three tracks: Business Economics, Organizational Studies, and Entrepreneurship and Technology Management. Courses feature case studies of for-profit and not-for-profit companies in a range of industries. The University is also working with officials at companies to deliver guest lectures and to develop internships. The program prepares students to start and lead companies after graduation.



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Young knowledge workers in the immediate post-college age group are important to attract in their own right. They are in many respects the “workhorses” of a regional technology economy. They have cutting-edge technical skills needed in high-technology industries, particularly in knowledge-intensive areas where technical skills tend to depreciate rather quickly.¹⁴

Preparing students for the knowledge economy

Brown offers opportunities for learning, for both graduates and undergraduates, in a number of fields that are particularly vital to the continued growth of Rhode Island’s knowledge-based economy. For example:

- › Brown offers an undergraduate concentration in **BIOMEDICAL ENGINEERING** that trains students in areas such as biomaterials and the design of medical instruments.

- › Undergraduate students concentrating in **COMPUTER SCIENCE** can specialize in areas such as software systems design, artificial intelligence and computer architecture.
- › Brown's **BRAIN SCIENCE PROGRAM** exemplifies the University's interdisciplinary approach to learning. The program offers both course work and research opportunities with faculty from 11 departments, ranging from biology to computer science to philosophy—all focused on questions that in the years ahead will be central to almost every field of human endeavor.
- › Students in a range of disciplines may opt to take the **UNDERGRADUATE TEACHER EDUCATION PROGRAM** to prepare for secondary teaching certification. This program allows biology, engineering, English, history, and social studies students to complement their studies with courses on teaching and experience in secondary school classrooms.

New and Expanding Graduate Programs

As the skills necessary to succeed in the knowledge economy become progressively more complex and specialized, graduate degrees are increasing in importance. As part of its Plan for Academic Enrichment, Brown University is expanding its graduate programs—particularly in areas that emphasize interdisciplinary education and practice.

New graduate programs benefit Rhode Island and Providence in a number of ways. They bring more graduate students and faculty into the state. Several of these programs will produce graduates who are well prepared to work in some of the state's leading growth industries. Here is a sample of new and expanding graduate programs at Brown:

- › Brown's Medical School and Department of Engineering now offer graduate degrees in **BIOMEDICAL ENGINEERING**. Students in the program will work with companies to develop biomedical tools and practices. After graduation, students will be uniquely prepared to contribute to Rhode Island's emerging life sciences industry cluster.
- › In conjunction with the Reuse in Rhode Island research program (discussed in detail in Section IV), the University will work to establish a new **M.S. IN ENVIRONMENTAL HEALTH & ENGINEERING** program. In addition to uniquely combining coursework in the life sciences, public health, and engineering, the



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program requires that students complete a year-long project at one of the state's 12 Superfund sites, gaining valuable work experience while helping to improve the state's environment.

- › Since 2001, the **BROWN-TRINITY CONSORTIUM** has offered several graduate degrees in the theater arts, including master's degrees in acting, directing, and theater studies, and a doctorate in theater and performance studies. Section VI includes more detailed information about this program.
- › Brown University has partnered with the Marine Biological Laboratory in Woods Hole—a premiere research institution—to offer a joint Ph.D. in **BIOLOGICAL AND ENVIRONMENTAL SCIENCES**. The program is designed for students interested in ecology, functional morphology, behavior and evolutionary biology, and gives them access to faculty and facilities at both institutions.
- › In the fall of 2005, Brown admitted its first class to its interdisciplinary **MASTER'S PROGRAM IN PUBLIC POLICY** at the Taubman Center for Public Policy and American Institutions. The program gives students the option of pursuing one of two degrees—a Master of Public Policy or a Master of Public Affairs, each of which may be tailored by students beginning a career in the public sector and at mid-career professionals. An emphasis on relevant experience—whether as part of multidisciplinary research teams or internships with local government and non-profit partners—gives students an opportunity to contribute directly to state and local institutions.

Continuing Education

As Americans compete for knowledge-based jobs in an increasingly global economy, many turn to continuing education programs to upgrade their skills or to jump-start a career change. Brown offers several programs that respond to this demand.

A Commitment to Public Health in Rhode Island

Just as Brown Medical School is Rhode Island's one medical school, Brown offers the only public health program in the state. Brown's approach to public health brings together faculty from multiple divisions to consider social, behavioral, and genetic factors in evaluating health.

Moreover, Brown's program is based upon close partnerships with the Rhode Island Department of Health, the Department of Human Services, and the University's affiliated hospitals. These partnerships have been instrumental in the success of the program's nine public health research centers—such as the Center for Behavioral and Preventive Medicine and the Institute for Community Health Promotion.

Brown's Program in Public Health is growing rapidly. The University plans to double enrollments in public health graduate programs to 160 in the next five to seven years. During the same time period, the Department of Community Health will nearly double its full-time faculty to 100.

- › Brown University offers a **RESUMED UNDERGRADUATE EDUCATION** program to students of any age who did not complete their baccalaureate coursework and would like to complete their education at Brown University. Twenty-eight adults are enrolled in the Resumed Undergraduate Education program for the 2005–06 academic year.
- › Brown offers non-credit courses to Providence-area residents through its **BROWN LEARNING COMMUNITY** program. In 2004–05, approximately 500 people enrolled in these courses, mostly in writing and foreign language courses.

Starting in spring 2006, the University will offer additional continuing education options to the public. Expanding on the popularity of the writing and language courses offered in the Learning Community program, the University is creating six- to eight-week tracks in both areas. Students will have the option of taking weekly course modules within each track.

The Department of Summer and Continuing Studies is also working on developing certificate and executive education courses, to begin in late 2006. The certificate courses will be designed to upgrade the knowledge and skills of local professionals in areas such as community health. The executive education program will offer the same courses as the certificate programs, but the courses will be offered over three days each month to give professionals additional scheduling flexibility.

Expanding Educational Opportunity

Brown's commitment to education is not limited to that which it provides to its own students. Brown is deeply involved in city and community efforts to improve the quality of elementary and secondary education in the Providence area, and to expand educational opportunity for local residents.

This commitment is evident both in the work of Brown's Department of Education and in wide range of community partnerships, such as those sponsored by the **SWEARER CENTER FOR PUBLIC SERVICE**. Established in 1987, the Swearer Center now supports approximately 40 partnerships with public agencies and community groups each year. Nearly 900 Brown students commit a total of 150,000 hours per year to community programs in the Greater Providence community and beyond. Major areas of engagement include education and youth development, arts and cultural programs, and health services.

Here are just a few examples of how Brown is helping to expand educational opportunity for Rhode Island residents.

- › Brown volunteers in the **COLLEGE GUIDANCE PROJECT** work with the guidance offices at Hope and Central high schools in Providence to provide individual attention to seniors applying to college. Volunteers work closely with guidance counselors to track the progress of college-bound students, offering workshops and individual advising to help them through the process.
- › The **LET'S GET READY!** Program helps 11th- and 12th-graders at Hope and Central high schools prepare to take the SAT. High school students participate in the program for one semester leading up to the SAT test. About 20 Brown volunteers coach small groups of students on their math and verbal skills. Coaches meet with a small group of high school students each week to provide SAT-focused academic support and teach test-taking strategies. Approximately 40 students from local high schools participate in this program each semester.



PHOTO © WILLIAM MERCER

Nearly 900 Brown students commit a total of 150,000 hours per year to community programs in the Greater Providence community and beyond. Major areas of engagement include education and youth development, arts and cultural programs, and health services.

- › Brown is helping to bridge the “digital divide” in Rhode Island. The University donated 39 computers to the Hope High School computer lab and eight wireless laptops to the Davey Lopes Community Center, along with a printer and two years of high-speed Internet access. In addition, Brown University students installed the machines and provide several hours of computer support per week. Brown’s donation to Hope High School and the Davey Lopes Center is worth more than \$35,000.
- › Ninth- and 10th-grade students at Hope and Central high schools get additional exposure to science and writing as part of the **PRE-COLLEGE ENRICHMENT PROGRAM (PCEP)**. The project includes hands-on science projects to get kids interested in learning. Approximately 40 students from local high schools participate in this program each semester and approximately 20 Brown students volunteer in it.
- › Recognizing that a better education can lead to better health, two Brown physicians started a non-profit organization called **RISE—RHODE ISLANDERS SPONSORING EDUCATION**. RISE helps children of incarcerated women enroll in small Rhode Island schools where they receive individualized instruction and—if needed—additional tutoring. RISE also matches each student with a long-term mentor. One hundred thirty kids currently participate in the program; that number is expected to grow to about 200 in 2006.
- › Each month, Brown students work with about 120 low-income children as part of the center’s **COMMUNITY OUTREACH FOR THE PERFORMING ARTS** program. Brown students lead classes in creative writing, dance, theater, and visual arts. At the same time, the Brown volunteers help the kids develop their own theatrical and musical performance pieces which are presented every year on Brown’s campus. In 2004, the Providence Housing Authority recognized the

Swearer Center as a key community partner in providing programs like this to public-housing residents.

- › Responding to the needs of a growing immigrant population, the Swearer Center offers instruction in **ENGLISH FOR SPEAKERS OF OTHER LANGUAGES (ESOL)** at several locations in the Providence area.

Brown supports efforts to improve education and expand educational opportunity not only through programs of direct engagement, but also through its mission of education and research. Brown’s Education Department prepares undergraduates for teaching careers and offers graduate programs and other opportunities for professional development.

While at Brown, undergraduate and graduate students make a significant contribution to Rhode Island schools. Each year, 40–45 students in the Master of Arts in Teaching program participate as student teachers in Providence-area schools and teach classes in summer programs such as SummerPrep and Brown Summer High School. Many of these students continue to teach in Rhode Island schools after they graduate. As of fall 2005, more than 150 Brown alumni are teaching in the state’s public, private, alternative, and charter schools.

University researchers also focus on a variety of issues critical to the needs of schools and students. For example:

- › Professor Cynthia Garcia Coll is conducting a study of 300 children of Cambodian, Dominican, and Portuguese immigrants. Her research focuses on the relationship between these children’s sense of ethnic identity and their engagement in school.
- › The Annenberg Institute for School Reform at Brown has been working closely with Providence public school leaders on a project that aims to redesign the city’s four public high schools.

Table 10: **Brown Medical School's
Affiliated Hospitals**

Affiliated Hospital	Location
Emma Pendleton Bradley Hospital	East Providence
Butler Hospital	Providence
Memorial Hospital of Rhode Island	Pawtucket
Miriam Hospital	Providence
Rhode Island Hospital	Providence
VA Medical Center	Providence
Women & Infants Hospital of Rhode Island	Providence

Developing Rhode Island's Physician Workforce

Brown Medical School—the one medical school in the Ocean State—plays a central role in training the physicians and researchers who are an important part of the workforce for this key industry cluster, and in life science innovation.

Brown cannot succeed in this enterprise alone: Medical students and faculty researchers need to have access to clinical facilities. In order to meet this need, Brown partners with seven Rhode Island hospitals. Brown Medical School is thus the heart of an *academic health center*: a cluster of educational, research, and health care institutions that collaborate closely in the education of physicians and other health professionals, in biomedical research, and in the delivery of health care. Table 10 lists Brown's seven affiliated institutions.

In addition to those physicians and other scientists who hold full-time faculty positions at Brown Medical School, more than a thousand medical professionals have clinical faculty appointments at Brown Medical School. Many of these faculty members also

practice medicine in the state; overall, more than 33 percent of the 4,508 licensed physicians in Rhode Island have a faculty appointment at Brown. Clinical faculty make an invaluable contribution to the education of physicians—and they benefit as well from the opportunity to stay in touch with the latest developments in their specialties, and to participate in research projects. The ultimate beneficiaries, of course, are the people of the state.

Brown University's academic health center is the state's leading source of new physicians. In fall 2005, 350 students were enrolled in Brown Medical School; during 2004–05 the school awarded 73 medical degrees. As of 2005, 337 Brown Medical School graduates were living in Rhode Island—16 percent of all those who have graduated from the school during the past 30 years.

Over the next five years, Brown Medical School will seek to increase its enrollment to 400 students. This will increase the impact that Brown has on the state's economy as a major enterprise in itself—and will also add to the University's capacity to educate Rhode Island's future physicians.

GRADUATE MEDICAL EDUCATION

After completing medical school, medical students must complete a two-year clinical residency or fellowship in order to be eligible to practice medicine. The clinical facilities at Brown's affiliated hospitals—combined with Brown Medical School's reputation and ability to draw top physician-researchers—make the Brown academic health center a major national draw for both patients and practitioners.

During the 2004–2005 year, Brown's academic health center enrolled 741 residents and fellows

Table 11: **Number of Residents and Fellows by Affiliated Hospital, 2005**

Medical Affiliate	Fellows	Residents	Major GME Specialties
Butler Hospital	11	53	Psychiatry
Memorial Hospital	3	69	Family practice, internal medicine
Miriam Hospital	2	0	Interventional cardiology
Rhode Island Hospital	127	440	Internal medicine, emergency medicine, pediatrics, surgery
Women & Infants Hospital	8	28	Obstetrics/gynecology
TOTAL	151	590	

across an array of specialties. The graduate medical education enrollment figures are listed in Table 11 along with a sampling of major specialties within each hospital. Residents and fellows have a significant role in the region's economy, providing a disproportionate share of uncompensated care to Rhode Island residents while attracting the best physician-researchers to work with these talented individuals.

CONTINUING MEDICAL EDUCATION

In addition to educating future health care professionals, Brown Medical School and its affiliated hospitals offer extensive opportunities for practicing physicians to upgrade their skills through continuing medical education programs. These opportunities range from weekly "grand rounds" at the hospitals, to one-day or multi-day conferences and courses on specific topics. In 2004-05, more than 8,000 health care professionals from the region participated in more than 56 CME activities sponsored by Brown Medical School.

Promoting Healthy Communities

In recent years, economists have come to recognize that the productivity and competitiveness of nations, states, and communities depends not only on overall levels of educational attainment, but also on the health of their residents. From an economic perspective, a healthy population is valuable in several ways. For employers, it translates into a more productive work force and reduces the losses that occur when employees or their children are sick. And it reduces the cost of medical care—a cost that, one way or another, the whole community must bear.

Brown Medical School, the Program in Public Health, and the University's affiliated hospitals together offer a wide range of programs that aim to improve the health of people in Providence and throughout the state. Here are a few examples.

- › Brown Medical School is an academic partner of the **RHODE ISLAND FREE CLINIC**, a non-profit organization that provides care to over 1,400 Rhode Island residents—many of whom are employed, but do not have medical insurance coverage. Brown University medical students, residents, fellows, and faculty volunteer time at the Free Clinic, which is a teaching site for medical residency programs at three of Brown's medical affiliates: Rhode Island Hospital, Memorial Hospital, and Women & Infants Hospital.
- › The **CENTER OF EXCELLENCE IN WOMEN'S HEALTH**

is operated jointly by Brown University and Women & Infants Hospital. While contributing to the understanding of women's health through research, the center provides services for women throughout the state. The center also works with the **WOMEN & INFANTS' FAMILY VAN**—a mobile, multilingual health clinic that provides free services to underserved communities in Rhode Island.

- › Researchers with Brown's **CENTER FOR GERONTOLOGY AND HEALTH CARE RESEARCH** are working to improve the quality of life for the Ocean State's oldest residents. In partnership with the University of Rhode Island, the center received a grant from the Robert Wood Johnson Foundation, called the Rhode Island Partnership to Improve Care at the End-of-Life.
- › Brown University is now home to a program that improves health-care access for the 10 percent of Rhode Island residents without health insurance. The program, funded by the federal Health Resources and Services Administration, is the **AREA HEALTH EDUCATION CENTER** of Rhode Island. The center helps to train medical, nursing, and pharmacy students in areas that serve large numbers of poor, minority, or non-English speaking patients, recruits poor and minority high school students into health professions, and creates continuing education programs for health care workers.

The program creates three regional facilities—in Providence, Woonsocket, and Newport. The Providence and Woonsocket centers have opened and the Newport center opens in October 2006. The proposal to establish the center was a result of Brown's partnership with many of the state's hospitals, universities, and the state Department of Health.



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Part IV: Partners in Science: Rhode Island's Leading Research Institution

For the past half-century, basic research has played a central role in the growth and development of the United States 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 United States 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.*¹⁵

Brown's research enterprise contributes to economic growth in Rhode Island and Providence in several ways:

- › Since 2001, Brown University has spent more than \$100 million on research each year. While most of that money originates outside of the state, the bulk of it is spent locally on salaries, supplies, equipment, and overhead costs. In effect, research is a significant Rhode Island "export."
- › This funding, combined with that of the University's research partners, has helped to turn Providence into a center of biomedical research—enhancing the quality of health care and helping to attract significant capital investments in places like the Jewelry District.
- › The opportunity to work side by side with faculty researchers enhances the quality of both undergraduate and graduate students' education. This experience can enhance the skills and knowledge that University graduates can offer to the state's employers.
- › University research sometimes leads directly to the development of new products and the creation of new businesses.

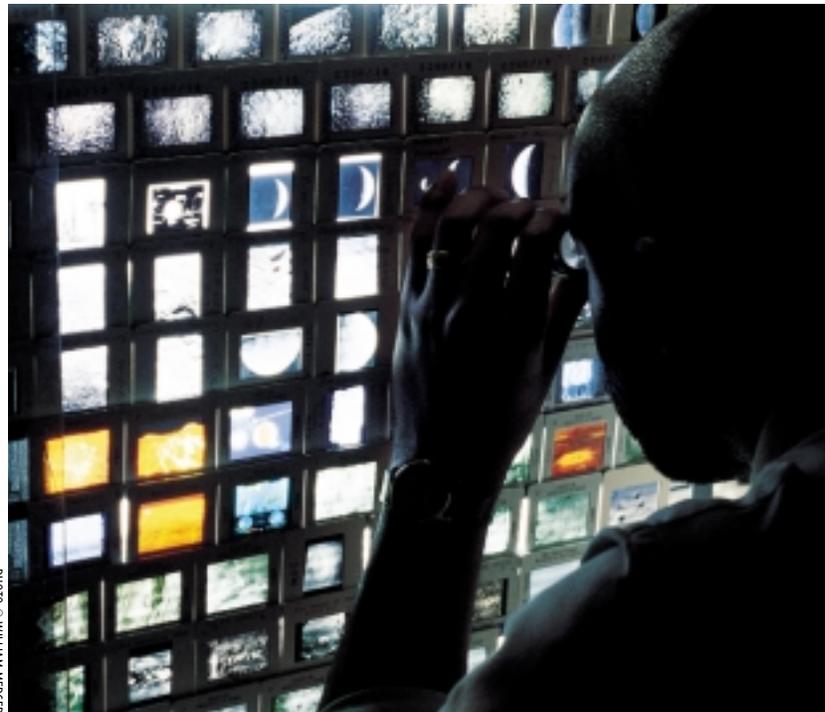


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Research Spending at Brown University

In 2005 research spending at Brown totaled \$144.6 million. Brown's research enterprise helps make Rhode Island's economy one of the most research-intensive in the nation; as noted in Part I, Rhode Island ranked seventh among the 50 states, measured by R&D as a percentage of gross state product. Rhode Island also ranks fifth in per capita federal

Table 12: Research Expenditures, FY 1999 through FY 2005

Fiscal year	Total research expenditures
1999	84,258
2000	90,608
2001	100,056
2002	111,886
2003	128,364
2004	130,438
2005	144,660



PHOTO © WILLIAM MERCER

The research enterprise at Brown University has grown rapidly during the past five years. Between 1999 and 2005, research expenditures increased by 59 percent—more than 8 percent annually

funding of academic research, with Brown accounting for roughly two-thirds of the total.

The research enterprise at Brown University has grown rapidly during the past five years. Between 1999 and 2005, research expenditures increased by 72 percent—9.4 percent annually (see Table 12).

Of the \$144.6 million the University spent on research in fiscal year 2005, the federal government accounted for \$113 million. Foundations made up the second largest portion of research spending by the University, accounting for about \$26.5 million—18 percent of the total. State and local sources accounted for about \$1 million in fiscal year 2005—less than one percent of the University’s research expenditures.

Partnerships in Biomedical Research

Brown University and its affiliated hospitals are helping to establish Providence—and the state of Rhode Island—as a center for biomedical research.

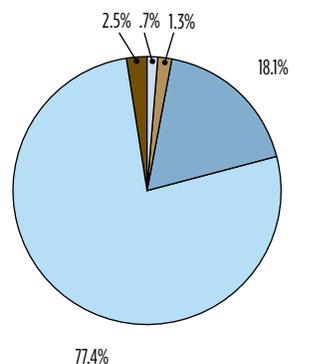
Table 13 shows the total amount awarded to six of Brown’s medical affiliates by the National Institutes of Health (NIH) in fiscal year 2004 for research grants, training grants, fellowships, and other awards. The table also indicates each hospital’s rank among the 124 independent hospitals receiving NIH awards in that year. Few U.S. cities have a single hospital that ranked in the top 20 in NIH funding and only two cities have more than one: Boston and Providence.

Of the \$133 million awarded to all Rhode Island institutions by NIH in fiscal year 2004, NIH awarded 87 percent of it to Brown University, its affiliates, and its biomedical spin-off companies (see Figure 7).

A few examples illustrate the breadth of biomedical and public health research conducted at Brown and its affiliated institutions.

› The **CENTERS FOR BEHAVIORAL AND PREVENTIVE MEDICINE** are the result of a partnership between

Figure 6: Research Expenditures by Source, FY 2005



- Federal
- Industry
- Institutional
- State and local
- Foundation and other



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Table 13: NIH Awards to Brown Medical School Affiliated Hospitals, FY 2004

Affiliated Hospital	Award Amount	Ranking
Rhode Island Hospital	\$ 27,063,956	13
Miriam Hospital	\$ 16,867,232	20
Women & Infants Hospital of Rhode Island	\$ 5,899,782	30
Emma Pendleton Bradley Hospital	\$ 4,180,257	36
Butler Hospital	\$ 3,902,919	37
Memorial Hospital of Rhode Island	\$ 2,088,325	45

The Miriam Hospital and Brown Medical School that combines behavioral research, education, and outreach. Research at the centers include the nationally prominent **WEIGHT CONTROL AND DIABETES RESEARCH CENTER**, the **PHYSICAL ACTIVITY RESEARCH CENTER**, and the **NICOTINE AND TOBACCO RESEARCH CENTER**. In addition to contributing to the understanding of major public health issues, the centers provide free clinics to help people quit smoking and lose weight. The Weight Control and Diabetes Research Center is the base of the national Study of Health Outcomes of Weight Loss (SHOW) clinical trial.

- › The **CENTER FOR ALCOHOL AND ADDICTION STUDIES** brings together faculty across 11 departments and several affiliated hospitals to identify, treat, and prevent substance abuse problems through research, education, training, and policy advocacy. The center translates its addiction research into clinical practice in the state of Rhode Island through its subcomponent, the **ADDICTION TECHNOLOGY TRANSFER CENTER OF NEW ENGLAND**. For example, the Technology Transfer Center is creating a workforce development initiative in order to address the shortage of Rhode Island counselors with experience working with drug and alcohol addicts.
- › Researchers in the fields of genetics and proteomics are generating mountains of data containing clues that could lead to fundamental discoveries about the origins and development of life. Brown's **CENTER FOR COMPUTATIONAL MOLECULAR BIOLOGY** brings

together researchers in biology, computer science, ecology, and statistics to develop new tools to analyze this data. The center was created in 2003 with a \$20 million gift to the University.

- › More than one in every five patients admitted to major hospitals in Rhode Island have diabetes. Operated by Rhode Island Hospital and affiliated with Brown Medical School, researchers with the **HALLETT CENTER FOR DIABETES AND ENDOCRINOLOGY** conduct basic and clinical research into diabetes and other endocrine diseases. The Hallett Center is located in the Coro Building in the Jewelry District—a short walk from Brown's Laboratories for Molecular Medicine.
- › The **BRADLEY/HASBRO CHILDREN'S RESEARCH CENTER** is also located in the Coro Building. The center brings together researchers from three institutions—Brown Medical School, Bradley Hospital, and Hasbro Children's Hospital, the pediatric division of Rhode Island Hospital—to study child development and mental health. Researchers study everything from HIV- and tobacco-use prevention to child anxiety and mood disorders.
- › In 2000, NIH awarded a five-year \$11 million Center of Biomedical Research Excellence (COBRE) award to Brown and renewed the award in October

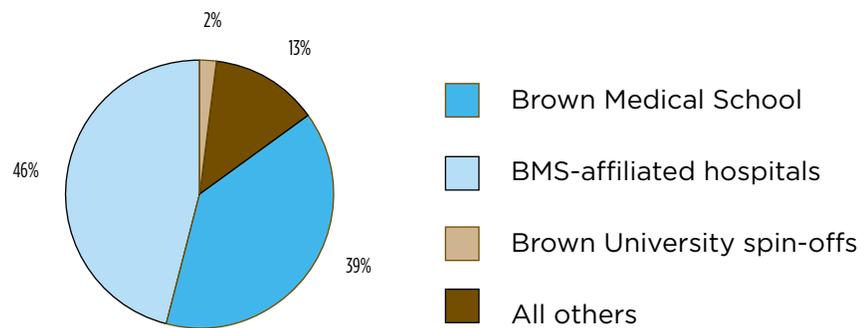


Investments in Biomedical Research Infrastructure

With their biomedical research awards, Brown and its partners have invested significantly in Rhode Island's biomedical research infrastructure—the people, buildings, and specialized equipment necessary to make future discoveries in the life sciences.

In 2004 the University—along with Memorial Hospital of Rhode Island—invested \$1.6 million to purchase a 3 Tesla Magnetic Resonance Imaging (MRI) equipment. The machine is housed at Memorial Hospital and is used in the Osteoarthritis Initiative—a five-year study within the University's **Center for Behavioral and Preventive Medicine**—to track the progression of the disease in patients' knees and hips. While helping researchers develop better treatments for osteoarthritis—a leading cause of disability in adults—several hundred Rhode Island residents will benefit immediately from the availability of the MRI. They have an opportunity to enroll in a clinical study and receive free consultation on their condition.

Figure 7: Recipients of \$133 Million Awarded by NIH to Rhode Island Institutions, FY 2004



2005. These \$11 million five-year grants equipped the Laboratories for Molecular Medicine and now support researchers studying the process that leads normal cells to become cancerous. Rhode Island is home to four COBREs, three of which involve Brown Medical School faculty: the COBRE for Perinatal Biology, the COBRE for Cancer Research Development, and the COBRE for Genetics and Genomics.

Research that Benefits Rhode Island

While biomedical research accounts for about 52 percent of the University's total research spending, the scope of Brown's research enterprise is much greater. Particularly noteworthy is the breadth of research activity that is relevant to the concerns of Rhode Island communities and industries. Here are just a few examples:

- › Since the 1980s, Brown's **CENTER FOR ENVIRONMENTAL STUDIES** has been engaged not only in educating students and conducting research, but also in prac-



A Partnership to Stimulate Life Sciences Research in the Ocean State

While Brown University already receives a significant proportion of federal funding for life sciences research, the university is working with the University of Rhode Island (URI) to secure more research funding for the state.

NSF's Experimental Program to Stimulate Competitive Research (EPSCoR) dedicates funding to states that historically have received less than 0.7 percent of NSF research funding annually. In 2004, Brown University and URI teamed up to submit a proposal to designate Rhode Island as an EPSCoR state.

The proposal was a success. NSF designated Rhode Island as an EPSCoR state and awarded the universities a \$198,000 planning grant. The EPSCoR designation benefits all universities in the state by allowing investigators access to NSF funds that would not otherwise be available.

The EPSCoR planning grant was used by Brown and URI to prepare a Research Infrastructure Improvement Grant that could be worth up to \$9 million. The grant would help the universities invest in equipment and other infrastructure that support life sciences research in the state—leading to important contributions to biomedical knowledge, creating additional jobs, and potentially leading to further commercialization of University technology.



PHOTO © RICHARD BENJAMIN

tical, hands-on efforts to protect the quality of Rhode Island's environment and the health of its residents. It has worked to raise awareness of—and fashion responses to—the dangers of lead poisoning, worked with local environmental councils on programs to protect the Narragansett watershed, and devised strategies for reducing greenhouse gas emissions.

- › In 2003, Brown and the Marine Biological Laboratory (MBL) in Woods Hole, Massachusetts, signed an agreement aimed at bringing together Brown's strengths in evolutionary biology and community ecology with MBL's strengths in genetics and ecosystems science. The **BROWN-MBL** partnership has already led to several joint research awards, including a five-year multimillion-dollar award from NASA's Astrobiology Institute that renewed an existing MBL research project studying the evolution of early forms of life and parallels on other planets.
- › With funding from NSF, Brown University established the **CENTER FOR ADVANCED MATERIALS RESEARCH**, a multidisciplinary institute focused on research and education in materials science. The center brings together engineering, physics, chemistry, and—more recently—biomedical researchers to develop experiments with micro- and nano-mechanics of materials and brain interfaces to biomaterials.
- › Researchers with Brown's **ANNENBERG INSTITUTE FOR SCHOOL REFORM** are developing programs to improve public education in Rhode Island. For example, The Annenberg Institute is partnering in Providence's effort to redesign its four high schools. The institute has contributed resources and expertise to help the district develop and carry out its redesign plans.



Pioneers in Limb-Loss Research

One consequence of improved body armor and military medical care is that more soldiers are surviving combat, but returning home with missing limbs. The U.S. Department of Veterans Affairs awarded \$7.2 million to researchers in the academic medical center and the Massachusetts Institute of Technology to help amputees—whether returning veterans or not—regain limb function and improve their quality of life.

The award helped to establish the **Center for Restorative and Regenerative Medicine** at the Providence VA Medical Center. The center’s director, Roy Aaron, leads the nine-member multidisciplinary team as they work on six related research projects (see Table 14).

Table 14: Biohybrid limbs sub-projects

Project and description	Partner affiliations
Limb lengthening. Researchers will use a surgical procedure to lengthen bones in amputees in order to improve the fit of a prosthesis.	Brown University Rhode Island Hospital The Miriam Hospital
Tissue engineering. Researchers will explore ways to restore damaged tissue and its function. These techniques could make it possible to repair, rather than replace, damaged knees and hips.	Brown University Rhode Island Hospital
Osseointegration. Researchers will develop improved methods of osseointegration—a process of connecting living tissue and titanium in order to provide a permanent, stable anchor for prosthetics.	Brown University
Robotics. Researchers will develop prosthetic knees and ankles that can be controlled by an amputee’s own nervous system.	Massachusetts Institute of Technology
Neuroprosthetics. Researchers will use a system called BrainGate to record brain signals, decode them, and transform them into movement commands that can control prosthetic arms or legs.	Brown University
Measuring outcomes. Researchers will conduct a study to show which surveys and physical performance tests best measure amputees’ quality of life, mobility, and satisfaction with prosthetic limbs. This data will be used in the creation of clinical trials resulting from the biohybrid limbs research.	Brown University

Reclaiming Rhode Island's Contaminated Land

While Rhode Island's older manufacturing industries helped build the state's economy, they also left behind a difficult legacy. Twelve sites, totaling 3,181 acres, are on the Superfund National Priorities List. There are also an estimated 300 brownfield sites in the state. Today the state is wrestling with how to address the health impacts of contaminated soil and water, and to clean up contaminated sites so that they can be redeveloped.

In 2004, Brown won an \$11.5 million, four-year grant from the National Institute of Environmental Health Sciences as part of the Superfund Basic Research Program. The project, called **Reuse in Rhode Island: A state-based approach to complex exposures**, addresses both issues: the reuse of contaminated land and better understanding the health impacts of the contaminants—particularly exposure to several toxins at once. Participants in the program include biomedical researchers, geologists, engineers, social scientists, and officials from two state agencies: the Rhode Island Department of Health and the Department of Environmental Management.

In addition to conducting research, Reuse in Rhode Island will work with local remediation firms to train workers in the skills needed to deal with complex forms of contamination. The program will also work with communities affected by contaminated soil and water—such as Tiverton, where byproducts from the former Fall River Gas Company have left the soil around 151 properties in Tiverton's Bay Street neighborhood

contaminated with arsenic, cyanide, lead, mercury and other compounds. It also includes funding to begin the process of commercializing new remediation technologies that might be developed as a result of Brown's research.

In the long run Reuse in Rhode Island will benefit the state's economy not only through the development of new technologies, but also by helping to turn real estate that is now a liability into an asset that can be used productively—and alleviating the risks that these sites create for Rhode Island residents.

- › The **TAUBMAN CENTER FOR PUBLIC POLICY** conducts foundation-supported interdisciplinary research on a wide range of public policy issues affecting Rhode Island. For example, the center analyzed the outcomes of the 1996 Family Independence Act—legislation that reformed the state's welfare system. The center also works with the Providence Housing Authority to produce reports and develop policies that support public housing residents in the city.
- › The **ENVIRONMENTAL CHANGE INITIATIVE** at Brown supports research addressing emerging environmental science and policy questions and trains new generations of students in research and environmental change. The initiative will create research projects and educational programs that address geological, human, and biogeochemical facets, among other aspects of environmental change. The participants include faculty from geological sciences, environ-



PHOTO COURTESY PNC/CB



mental studies, ecology and evolutionary biology, economics, sociology, and the Watson Institute's global environment program.

Student Involvement in Research

The opportunity to participate in research projects is one of the most important parts of undergraduate education at Brown. Undergraduate research exposes students to the very latest knowledge, tools, and technology, and helps them learn practical skills in areas such as working as part of a team, project management, and communication. The experience can be invaluable—both for those who move on to graduate studies and those who are moving directly into the job market.

Brown undergraduates have a number of research opportunities available to them. For example:

- › Through the Center for Advanced Materials Research, Brown undergraduates may participate in the NSF-supported **RESEARCH EXPERIENCES FOR UNDERGRADUATES** program. This program gives students an opportunity to work alongside a faculty member for 10 weeks over the summer. Past students have conducted research on everything from *E. coli* bacteria to carbon nanotubes—fiber-like structures that measure several nanometers in diameter and up to a millimeter long with applications ranging from energy storage to composite materials. In addition to gaining valuable research experience, students receive a stipend and housing cost reimbursement.
- › Brown students may also apply for a **KAREN T. ROMER UNDERGRADUATE TEACHING AND RESEARCH ASSISTANTSHIP (UTRA)** fellowship. This competitive program allows students to work alongside faculty—and sometimes with small teams of other students—as research assistants and teaching assistants. Recent UTRA fellows have authored and co-authored papers that have been published in the journals *Blood*, the *New England Journal on Criminal and Confinement*, and *Gene*.

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Part V: Partners in Investment: The Infrastructure of the Knowledge Economy

Brown University's spending on construction, as noted in Part II, directly generates hundreds of full-time-equivalent jobs each year in construction and related industries, and—through the multiplier effect of spending by contractors and construction workers—hundreds of additional jobs throughout Rhode Island.

But the value of University construction is not limited to its short-term impact on job creation. University construction is also an investment in the facilities needed to support the continued growth and development of Brown's educational and research enterprise—and at the same time an investment in the future of Rhode Island and of its capital city.

During the last six years, University construction spending has totaled \$306 million—an average of \$51 million per year. Major projects during this period have included:

- › Construction of a new 50,000-square-foot building at 295 Lloyd Avenue, housing the University's facilities management staff, completed in 2003.
- › Development of a new library annex at 10 Park Lane.
- › Renovation of **T.F. GREEN HALL**, to provide improved practice and performance space for student groups.
- › Conversion of a former industrial building at 70 Ship Street into the 105,000-square-foot **LABORATORIES FOR MOLECULAR MEDICINE**, a biomedical research building completed in 2005.
- › A new **LIFE SCIENCES BUILDING** will be completed



in 2006, containing 170,000 square feet of research labs and offices.

The development of the Laboratories for Molecular Medicine at 70 Ship Street represents a particularly important milestone, both for the University and the City of Providence. In addition to providing desperately needed research space, the project represented the first tangible result of Brown's strategic decision (as discussed in Part I) to expand beyond the confines of College Hill. For Providence, 70 Ship Street—a former industrial building converted to biomedical labs—is emblematic of the city's transition from an older industrial economy to one built on ideas and information.

Brown's involvement in the revitalization of the Jewelry District is not limited to 70 Ship Street. The University leases about 130,000 square feet of space

Partnering to Sustain Providence's Growth

In 2003, Brown University, Johnson & Wales University, the Rhode Island School of Design, and Providence College signed an agreement with the city to make voluntary contributions over the next 20 years in lieu of property tax payments. Under the three provisions of the agreement, Brown will contribute at least \$1 million per year during the next 20 years and will make additional voluntary contributions for taxable property the University acquires.

The agreement is independent of Brown's existing commitment to contribute the full assessed value of property taxes on any property that Brown leases to commercial tenants, such as 121 South Main Street.

This revenue will help the City of Providence pay for public education, infrastructure, amenities, and programs that will help the city prepare its own workforce for the knowledge economy while attracting talent from outside the state.

in more than four buildings in the Jewelry District for research and clinical facilities and for the offices of Advancement and Investment. Approximately 500 Brown employees work in leased space in the Jewelry District.

Brown anticipates that it will continue to invest heavily in expansion and upgrading of its facilities. Through 2010, Brown plans to invest an additional \$336 million in a variety of capital projects. These projects include:

- › **THE WALK**, which will unify the historic Brown and Pembroke campuses, with a variety of new interconnected green spaces.
- › **SIDNEY E. FRANK HALL**, 50,000 square feet of new construction and the future home of the administrative offices of the multi-disciplinary Brain Science Program as well as the Department of Cognitive and Linguistic Sciences.
- › The \$10-million renovation and expansion of **PEMBROKE HALL**, restoring this historic space to house the new Cogut Humanities Center and the Pembroke Center for Teaching and Research on Women.
- › A \$2.4-million renovation of the **GRANT RECITAL HALL** to create a first-class hall for pianists, small ensembles, dance performances, and other multi-media performances.
- › **THE FRIEDMAN STUDY CENTER**—renovation of more than 14,000 square feet on three floors of the Sciences Library to create a common study space that will be open to students 24 hours a day.





PHOTO © CATHERINE KARNOW

Brown University has increased its rate of technology transfer during the past five years. . . . the University's "innovation pipeline"—the number of invention disclosures—has increased nearly fourfold since 2000.

- › **THE JONATHAN NELSON FITNESS CENTER**, a 35,000-square-foot athletic complex designed to house a full-service fitness and wellness facility to meet the needs of the Brown community.
- › A new 30,000-square-foot **CREATIVE ARTS CENTER** which will include space for interdisciplinary arts research by students and faculty.

Brown's construction program is essential to the continued development of the University's education and research programs. By the spring of 2006, for example, the new Life Sciences Building and the Laboratories for Molecular Medicine will together increase the University's supply of biomedical research space by 75 percent. Projects such as the Watson Institute for International Studies' new home and the Creative Arts Center support new approaches to teaching and learn-

ing. Moreover, projects such as the renovation of T.F. Green Hall, the Friedman Study Center and the Nelson Fitness Center enhance Brown's ability to attract the most talented students to Providence from around the nation and the world.

As part of Strategic Growth Initiative, Brown University purchased the building in Providence located at 121 South Main Street that contains a 160,000-gross-square-foot office building and a 160-space parking garage at the foot of College Hill. The 11-story building was constructed by the Old Stone Corporation in 1984. Brown will continue to lease space to the building's existing tenants, including Hemenway's Restaurant, U.S. Housing and Urban Development, Brown Rudnick, Morrison Mahoney, and others.

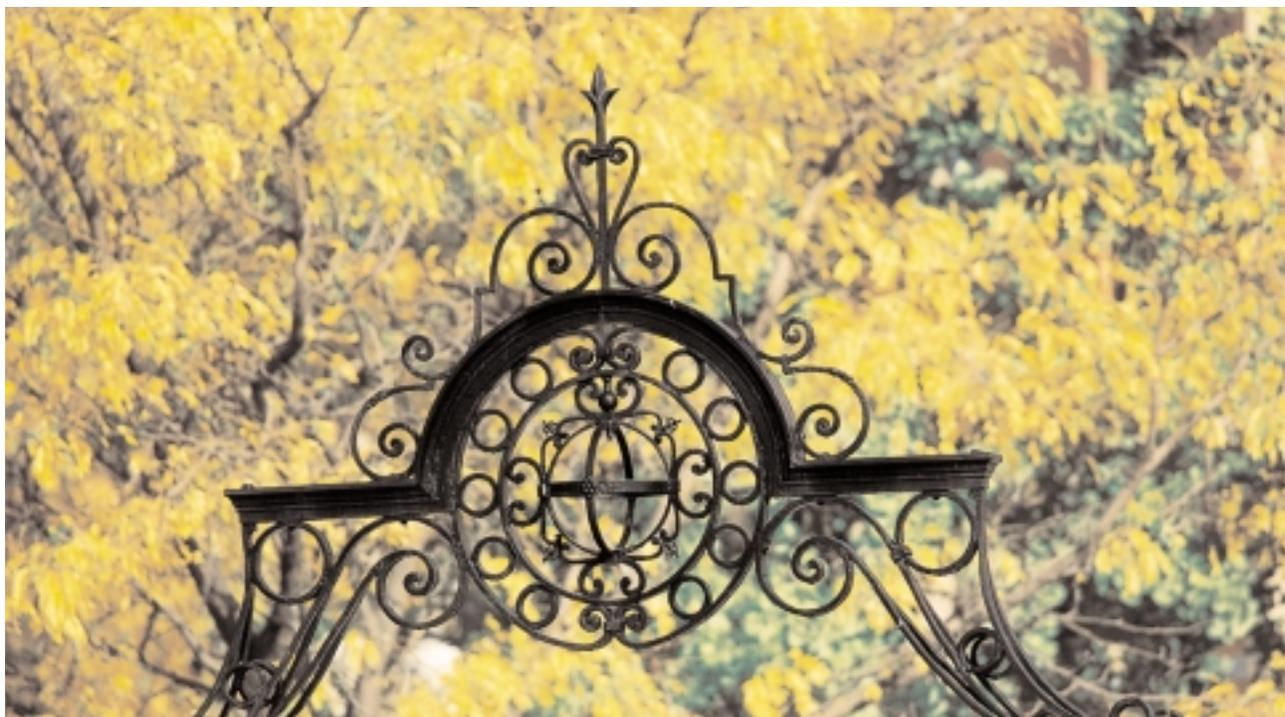


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Part VI: Partners in Innovation: Technology, Entrepreneurship, and the Arts

Innovation and entrepreneurship are critical to the continued growth and development of Rhode Island’s knowledge economy. They are the driving force of every segment of that economy—from the life sciences and information technology to architecture and engineering to the visual and performing arts.

As diverse as these various industry segments might seem, the conditions under which they flourish are essentially the same. Indeed, they can be mutually reinforcing—a vibrant cultural community is an essential part of what makes a city attractive to talented scientists, engineers, and entrepreneurs, and they in turn provide the demand that sustains the arts.

Both through its own activities and through a network of partnerships that range from state agencies and major corporations to small start-ups and grass-roots community groups, Brown is working to sustain the kind of environment that fosters innovation, entrepreneurships, and a vibrant cultural community.

Brown’s New Technology Transfer Program

The term “technology transfer” refers to the activities that help to translate basic academic research and intellectual property into commercial value—through new pharmaceutical products, medical devices, computer software, or advanced materials, for example. It typically involves a sequence of steps, from disclosure of new discoveries or inventions by University faculty or other researchers, to securing patents on those inventions, and the licensing of technologies developed in University labs to companies interested in developing them for commercial purposes.

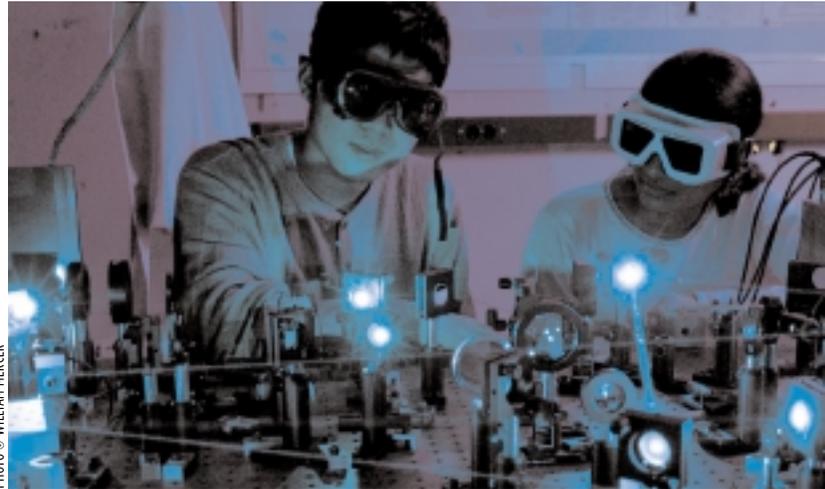


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BROWN TECHNOLOGY PARTNERSHIPS (BTP) manages the technology transfer process for the University—monitoring disclosure of new inventions, applying for patents, negotiating licensing agreements with companies that want to use Brown’s “intellectual property” for commercial purposes—and in some cases assisting in the creation of new business ventures committed to bringing Brown technologies into the marketplace. BTP also provides technology transfer services for two of the University’s partners: the Marine Biological Laboratory and Women & Infants Hospital.

Brown University has increased its rate of technology transfer during the past five years. The number of licenses and options executed has increased steadily, and one of the best indicators of the University’s “innovation pipeline”—the number of invention disclosures—has increased nearly fourfold since 2000.

Between 2000 and 2004, Brown researchers received 87 patents. Among Rhode Island-based public and private organizations, Brown was second only to the U.S. Navy in patenting for that time period.

SPIN-OFF COMPANIES

In addition to licensing technologies to established companies, Brown also supports the creation of “spin-off” companies—new ventures that are created to commercialize University technologies. Between 2000

Table 15: Selected Technology Transfer Measures, 2000–2005

Year	Gross license income	Invention disclosures	New patent applications filed	Patents issued	Licenses / options executed	Spin-offs formed
2000	2,122,410	22	35	14	6	4
2001	2,728,556	40	45	22	4	1
2002	1,145,291	53	55	19	9	4
2003	1,460,540	51	58	16	13	3
2004	1,043,581	75	54	16	9	4
2005	1,973,284	83	39	7	9	6

and 2005, Brown entered into licensing agreements with 22 companies. Table 16 presents a sample of Brown spin-off companies. University spin-offs are particularly beneficial to a region’s economy because they are more likely to stay in the region—close to the university from which they originally licensed their technology.

In cases where start-ups relocate outside the city or the state, the companies leave lasting effects in the region: Clusters of spin-off companies help form a “critical mass” of entrepreneurial companies that can attract both financial and human capital, and encourage other people to follow the same path.¹⁶

Here are some examples of Brown University’s recent spin-off companies:

- ▶ **SOLARIS NANOSCIENCES**, a Brown University spin-off company, has developed technology that significantly reduces the cost of solar panels while improving their efficiency. With the solar energy market expected to grow to \$18 billion by 2010, Solaris is poised to be a significant supplier of solar

panel technology. In 2004, the firm received \$750,000 in seed funding from Spectra Systems, Solaris’s parent company and another Brown spin-off, and \$150,000 in May 2005 from the Slater Fund. The company is targeting \$3.5 million for its first round of investor funding.

- ▶ Another Brown spin-off, **EPIVAX, INC.**, has developed bioinformatics tools and techniques for use in designing effective therapeutics for smallpox, AIDS, tuberculosis, cancer, and other diseases. In September 2004, the Providence-based firm was awarded an \$859,000 National Institutes of Health biodefense grant that allows the company to collaborate with TB/HIV Research Lab at Brown University, Rhode Island Hospital, and the Martha’s Vineyard Hospital to develop a vaccine to counter Tularemia, considered a possible agent for bioterrorism. An initial seed grant of \$70,000 from Brown University was a critical factor in the development of this research program.
- ▶ **SPHERICS, INC.** is developing technologies that improve the effectiveness of pharmaceuticals by

Table 16: Selected Brown University Spin-Off Companies

Company	Location	Founded	Employees (FTE)
EpiVax, Inc.	Providence, RI	1997	13
IAM Technology, Inc.	Providence, RI	2004	2.5
NABsys, Inc.	Providence, RI	2004	2
Neurotech, Inc.	Lincoln, RI	2000	15
Spherics, Inc.	Lincoln, RI	2000	30
Solaris Nanosciences, Inc.	Providence, RI	2004	9
Spectra Systems, Inc.	Providence, RI	1996	17



Brown University is home to museums and galleries featuring everything from classical artifacts to modern photographic art.

improving absorption in the gastrointestinal tract. The company is focusing these technologies—based on nanoparticle and bioadhesive polymer research conducted at Brown—on drugs that will treat gastrointestinal disease, central nervous system disease, and cancer. In May 2005, Spherics raised \$26.4 million in a round of financing that will be used to continue clinical trials of its products and establish manufacturing capabilities.

- › As the volume and complexity of Internet communication have increased, so have demands on security. **IAM TECHNOLOGY, INC.** was founded to develop a product that can validate Internet users' identities rapidly and inexpensively. IAM's product is based on a technology known as a Secure Transaction Management System (STMS) that was developed in Brown's Center for Geometric Computing. In exchange for licensing the technology, the University received an equity stake in the company. This arrangement allows IAM to invest its cash in research and development activities in its Providence office and provides additional incentive for the University to see the company succeed.

Connecting Entrepreneurs, Promoting Entrepreneurship

In collaboration with city and state governments, other institutions and the private sector, Brown University is working to make Rhode Island a fertile environment for new companies.

With funding from corporate and private sponsors, Brown's Entrepreneurship Program—started by students in 1998—helps to nurture undergraduate business ideas through contacts with alumni mentors and business plan competitions. The top team in the program's New Venture Competition wins \$25,000 in cash and services and the two second-prize winners each win \$12,500. The winner of the spring 2005 New Venture Presentation award was LifeSine, a Providence company that is developing a medical device capable of quickly and painlessly measuring the severity of an asthma attack for patients entering an emergency room.

The **BROWN FORUM FOR ENTERPRISE** provides educational resources to fledgling Rhode Island businesses while helping to connect investors and experienced managers to local start-up companies.

The Forum is the state's primary networking resource for entrepreneurs and the institutions and companies that support them. Each year, the Brown Forum for Enterprise hosts conferences and forums at Brown University and other colleges and universities in Rhode Island. The events bring together entrepreneurs, researchers, students, and venture capital firms. Recent conferences have included:

- › **NANOTECHNOLOGY AND OPPORTUNITIES FOR RHODE ISLAND**, which brought

A Research and Commercialization Partnership with Cyberkinetics, Inc.

In 2001, Dr. John Donoghue, chair of the Department of Neuroscience at Brown, spun off Cyberkinetics, Inc. as a result of his research into technology that allows people with severe motor impairments to move their limbs and operate devices through thought alone. The technology is known by its commercial name, BrainGate.

In June 2005, Brown and Cyberkinetics signed a collaborative research agreement that allows Brown researchers to access data that is generated as a result of BrainGate clinical trials. This data will be incorporated into new neuroscience research programs at the University.

This two-way flow of research and technology—with Brown providing the underlying technology that makes the commercial BrainGate product possible and Cyberkinetics providing raw data that can be incorporated into future research studies—maximizes Brown's capacity to support both research and technology transfer.

The Technology— and Business— of Better Sleep

Three Brown University alumni want to make sure their customers never wake up on the wrong side of the bed. Eric Shashoua, Ben Rubin, and Jason Donahue established Axon Labs, a Providence start-up that is developing an alarm clock that will monitor the sleeper's brain waves starting about 20 minutes before her alarm is set to go off. When her sleep cycle becomes shallow, the alarm will sound. This helps her avoid the "sleep inertia" that results when an alarm wakes her from a deep sleep, potentially increasing her alertness throughout the morning.

Even while Shashoua, Donahue, and Rubin were in school, they were busy developing a business plan and getting funding for their work. As part of the New Venture Competition within Brown's Entrepreneurship Program, they received \$12,500 in cash and services. The company also won a Brown-administered National Collegiate Inventors and Innovators Alliance grant worth \$18,000 that spring. The team is also receiving assistance from Dr. Richard Millman, the Director of the Sleep Disorder Center at Rhode Island Hospital. Dr. Millman and his staff are testing the headband that must be worn to determine whether it is effective at measuring the depth of sleep.

For now the three students are staying in Providence as they perfect the technology and prepare for the final design. When several prestigious New York-based consulting firms offered Jason Donahue a job, he turned them down, saying, "The diverse experience I'm getting here is tenfold what I'd get in another area."

together researchers, leaders of nanotechnology companies, and investors to discuss opportunities for commercializing nanotechnology research in Rhode Island; and

- › **RAISING CAPITAL**, a panel discussion that featured representatives from venture capital firms discussing how entrepreneurs can make their businesses as attractive as possible to investors.

Brown Forum for Enterprise also offers **START-UP CLINICS** that give Rhode Island entrepreneurs 15 minutes to present their business idea to a diverse group of investors, business owners, and potential customers. Budding entrepreneurs get useful exposure and free advice from the kinds of people who will be able to make their business a success in the future.

Brown University is an underwriter of the **RHODE ISLAND BUSINESS PLAN COMPETITION**. Starting with the 2006 competitions, two tracks will be offered—one for students and one for non-student entrepreneurs. The competition is judged by Brown faculty, investors, and Rhode Island economic development officials who will base their selection on each team's business plan, the business' technical feasibility, potential for growth, and the credibility of the team. The winner of each track receives \$25,000 in cash and \$32,500 in services provided they establish their new business in Rhode Island. Before the competition, participants will be able to prepare by participating in free workshops such as "Getting Your Business Off the Ground," "Writing a Business Plan," and "Pitching Your Business."

Brown Alumni and Faculty as Entrepreneurs

Brown's investment in creating an entrepreneurial environment on and around its campus has the effect of stimulating Brown alumni and faculty to start their own businesses. Some of these involve technology licensed from the University, but many do not. For example:

- › Founded in 1996, **ANDERA** helps banks and credit unions open new accounts and capture new customer relationships with open technology interfaces. The company's chairman, Steve Siegel, and president, Charlie Kroll, are both Brown alumni.
- › **HEARTLAB**, a leading maker of systems for the management of cardiac imaging information, was founded in 1994 by Jonathan Elion, a clinical professor at Brown Medical School, and Robert Petrocelli, a researcher in his lab. Today the company, located in Westerly, employs 137 people.
- › **AXON LABS** was founded by Brown undergraduate students in computer science, cognitive science, and neurology. The students are commercializing a sophisticated alarm clock named SleepSmart that monitors the depth of the wearer's sleep in order to wake him or her at the most shallow point. (See the sidebar at left for additional information on AXON Labs.)

Table 17 lists additional Rhode Island companies started by Brown alumni and faculty members

A Vibrant Community Culture in Providence

Why do some cities prosper while others falter? As Section III suggests, attracting and retaining a talented work force is a major factor. Recently, economists like Richard Florida have attempted to explain the conditions that keep talented workers in a region. While access to good jobs is a key factor, they also point to cities that



Training the Next Generation of Performing Artists

Ask any theater fan in the Northeast about performing arts in Providence and they're sure to mention Trinity Repertory Company ("Trinity Rep"). With eight major productions and an audience of over 185,000 each year, the theater is among the most respected regional theaters in the country.

In 2001, Brown partnered with Trinity Rep to develop a joint graduate program in the theater arts. The program adds an M.F.A. in acting and directing and a Ph.D. in theater and performance studies. Graduate students in the program have access to Trinity Rep's new performance space—the Pell Chafee Performance Center—Brown's libraries, and creative collaborators—faculty and students—at both institutions.



offer a high quality of life: opportunities for outdoor recreation such as hiking, swimming, and boating; and stimulating cultural and social activities such as live music, art galleries, and theater.

Brown University plays a significant role in creating these amenities in Providence. Stimulated by a constant inflow of talented young people, a fertile arts community flourishes in Providence—attracting people who participate in the visual arts, music, theater, and dance, as well as those who appreciate them.

The **BROWN UNIVERSITY ORCHESTRA** was founded in 1918 and is now in its 88th season. Under the direction of conductor Paul Phillips, the Orchestra received the 2004 ASCAP Award for "Adventurous Programming of Contemporary Music" in the Collegiate Orchestra Division—the sixth time that the Orchestra has won this honor. All students at Brown and the Rhode Island School of Design, members of the faculty and staff of both institutions, and community members are welcome to audition. The Orchestra typically performs in Sayles Hall—a 590-seat auditorium—two to three times per semester.

The 55-member **BROWN UNIVERSITY CHORUS** is equally at home whether

Table 17 Selected Rhode Island Companies Started or Led by Brown Alumni

Company	Location	Person, Title	Founded	Employees (FTE)
Bay Computer Assoc.	Cranston	David A. Durfee, President	1981	18
Andera	Providence	Charles Kroll, President Steve Siegel, Chairman	1996	12
Axon Labs	Providence	Eric Shashoua, Co-founder Ben Rubin, Co-founder Jason Donahue, Co-founder	2003	5
Stone Tower Properties	E Providence	Robert Nickerson, President	1981	—
HeartLab	Westerly	Jonathan Elion, Co-founder Robert Petrocelli, CEO	1996	137
Nestor, Inc.	E Providence	Leon Cooper, Co-founder Charles Elbaum, Co-founder	1997	65

performing in Providence or abroad. The Chorus performs in Providence about six times per semester—including its annual invitation to sing Christmas carols at the annual tree-lighting ceremony at the Hospital Trust Plaza. This event honors the work of hospice organizations throughout Rhode Island.

Providence theatergoers don't need directions to find the Catherine Bryan Dill Center for the Performing Arts—the location of Brown's three main performance spaces: Leeds Theatre, Stuart Theatre, and the Ashamu Theatre. Brown's theatre program—which has been entertaining and educating Providence audiences since 1868—typically stages three major works per semester, dozens of smaller works, and a popular summer series. During the 2004–2005 season, more than 500 community residents bought tickets to Brown Theatre performances and many more attended free events throughout the year.

In conjunction with Trinity Rep, Brown offers intensive six-week summer residency programs to undergraduates and pre-college students, called the **APPRENTICE** and **THEATREBRIDGE COMPANIES**, respectively. Students work with graduate students in the theater program and with Brown theater alumni who return to Providence as mentors and directors. As a special treat for Providence audiences, the University hosts free theatrical events during Festival Week each summer.

RITES & REASON is an experimental theater group that develops and produces the works of primarily black playwrights. The group uses a “Research-to-Performance Method” to create new theatrical works, starting with historic documents, artifacts, interviews, and personal experience. This approach has created a play about the effects of urban renewal in a black community, and a play about black women's issues. The company produces everything from workshops to readings to mainstage plays and has staged over 75 original shows since it was founded in 1970.

Brown University is home to museums and galleries featuring everything from classical artifacts to modern photographic art. The **HAFFENREFFER MUSEUM OF ANTHROPOLOGY** educates the Brown University community and the general public about cultural differences and similarities through research-based exhibitions. The museum contains nearly 73,000—primarily Native American—artifacts. Haffnereffer's programs include lectures, exhibits, and publications. Recent programs have included *Dragon Bridge: Taoist Paintings of the Mien*, a collection of 17th century paintings from the highlands of southern China.

The **DAVID WINTON BELL GALLERY**, opened in 1971, presents six to eight major exhibitions each academic year. The program includes an annual student show and a triennial faculty exhibition, an annual New England artists' show, and works by leading contemporary artists from around the country. In addition to its contemporary exhibitions, the gallery maintains a permanent collection of more than 4,000 works of art, from Rembrandt to Anthony Caro and Diego Rivera.

Brown also brings renowned speakers and writers to Providence for lectures and readings that are free and open to the public. Recent speakers have included former President Bill Clinton, Mexican writers Valerie Mejer Caso and Jennifer Clement, historian John Hope Franklin, and NPR correspondent Mara Liasson.

The University is also actively involved in fostering cultural activities in what might seem to be unlikely places. For example, **SPACE**—Space in Prison for the Arts and Creative Expression—was created in 1992 by a group of Brown volunteers. The program conducts workshops on theater, creative writing and the visual arts for women in prison in Rhode Island.

A Culture of Social Entrepreneurship

Just as Brown prepares students to become for-profit entrepreneurs, the Swearer Center and the public service culture at Brown prepare students to start their own non-profits, creating long-term impacts in Providence.

Through the **CV Starr National Service Fellows** program and other University-sponsored service fellowships, the Swearer Center provides financial support to students developing their own outreach programs. For example, Rex Cheung is developing a program called “Calculus at Hope.” Rex will create a calculus class at Hope High School for promising students who would not otherwise have access to advanced math courses to prepare for college.

After they graduate, alumni continue to make an impact in the community as social entrepreneurs. Tyler Denmead, a 1998 graduate, founded **New Urban Arts**, an organization that offers after-school arts programs to students in Providence Public High Schools. The organization recruits 15 artist mentors—high school students, undergraduate and graduate students, and local artists—to volunteer to work with 125 high school students. Mentors help the kids produce art in various media while also providing college guidance, tutoring, and a personal connection. New Urban Arts hosts frequent exhibitions of student work—much to the delight of proud parents.

Part VII: Building the Future in Rhode Island

As this report has shown, Brown University has been an active partner in a broad-based effort through which state and local governments, the business community, colleges, universities and hospitals, community organizations, and others have begun to respond more effectively to the demands of an evolving economy.

As an employer, a sponsor of major construction projects, a magnet for research funding, and a seedbed for the creation of new companies, Brown has been collaborating with all of these interests to help sustain the resurgence Rhode Island has enjoyed in the past few years.

As significant as Brown's contribution to the process of economic revitalization and growth has been during the past few years, it will be even greater in the years ahead. In part, this is due to the underlying trends that will continue to reshape Rhode Island's economy—but even more to Brown's ongoing collaboration with the state, the city, and other partners in efforts aimed at building both the University's future, and Rhode Island's.

SCIENCE AS A SOURCE OF ECONOMIC GROWTH

The economic history of the past half-century has been characterized by (among other things) the growing importance of scientific research and technological innovation as drivers of economic growth. This trend seems certain to continue. As the state's leading center of scientific research and development, Brown will continue to play a central role in creating new knowledge in areas such as nanotechnology and neuroscience that will provide new opportunities for growth.

The potential for new scientific knowledge to produce new economic growth is especially great in the life



PHOTO © RICHARD BENJAMIN

sciences; and Rhode Island is already well positioned to take advantage of this opportunity. Together, Brown and its research partners—the seven hospitals affiliated with Brown Medical School, the University of Rhode Island, the Marine Biological Laboratory, major companies, and Brown-related start-ups—will lead the continued development of the Providence area as a major center for life sciences research.



PHOTO © WILLIAM MERCER

Brown must expand beyond College Hill. This strategic decision opens up a wide range of new opportunities—for both the University and the City of Providence.

Boldly Brown: The Campaign for Academic Enrichment

In October 2005, Brown University President Ruth J. Simmons launched “Boldly Brown: The Campaign for Academic Enrichment”—a \$1.4 billion initiative to fund the Plan for Academic Enrichment. This campaign is the largest campaign in the University’s history and will help Brown invest in three interrelated areas: students and academics, faculty and research, and facilities. These investments directly benefit Rhode Island in several ways.

The Campaign helps Brown continue to attract the brightest young minds to Providence. Campaign-funded scholarships and fellowships give more students the opportunity to attend and conduct research at the University. Moreover, by funding the University’s new and expanding academic programs, the Campaign helps to educate the next generation of artists, entrepreneurs, and problem solvers.

With funding for new professorships and research centers, the Campaign helps Brown recruit new faculty and fund interdisciplinary research. Each new researcher

improves the quality of education at Brown, while increasing the University’s capacity to draw research funding to the state.

In order to accommodate the growth in Brown’s student body, its faculty, its academic programs, and research centers, the Campaign will raise \$200 million to invest in constructing and upgrading facilities such as the new \$100-million Life Sciences Building. In the short term, these capital investments create hundreds of local construction jobs. Over time, these facilities will give rise to new research collaborations and discoveries, helping to propel Rhode Island’s knowledge economy forward.

As with other University revenues, it is expected that most of the money raised through the Campaign comes from sources outside the state, and because Brown’s spending on goods, services, and salaries support the local economy, these are investments in Rhode Island’s future as well as Brown’s.

THE IMPORTANCE OF HUMAN CAPITAL

More than ever, human capital is likely in years ahead to be the single most important determinant of whether states and cities flourish or falter economically. As a leading university, Brown is well-positioned to help the city and the state meet a growing demand for well-educated, highly-skilled workers.

Brown’s Plan for Academic Enrichment provides a roadmap for enhancing the University’s capacity to educate students—especially in areas that cross traditional disciplines—and to prepare them for careers in the knowledge economy. It will enable Brown to bring to Rhode Island more of the talented people—faculty, researchers and students—on whom the state’s future depends. The Plan for Academic Enrichment has already resulted in the hiring of 51 new faculty members since 2003, and during the next few years could result in the hiring of 49 more. As with its research enterprise, Brown’s partnerships with organizations such as the Marine Biological Laboratory, Trinity Rep and Brown Medical School’s teaching hospitals will be critical to its success in developing Rhode Island’s human capital.

INVESTING IN BROWN’S GROWTH—AND RHODE ISLAND’S

To sustain the growth of its research and teaching enterprise, Brown will have to keep investing in facilities for research and teaching. This is not simply a matter of needing more space. It also reflects a need to create different kinds of space—research space that is, for example, designed to support collaboration across disciplines, and between researchers at Brown and its affiliated institutions. Similarly the University will have to keep investing in the ancillary facilities that will ensure its continued ability to attract the best teachers, researchers, and students to Rhode Island.

The University’s Strategic Growth Initiative



PHOTO COURTESY PWCVB

Stronger partnerships—with the city itself, with other institutions and community organizations—can help make both Brown and Providence more attractive to the talented people on whom their shared future depends.

provides a framework for the University's investment in new facilities. Some of this development—such as the new Sidney Frank Hall and the Center for Creative Arts—will take place on Brown's College Hill campus. As noted in Part V, however, the SGI also recognizes that to fulfill its potential for growth, Brown must expand beyond College Hill. This strategic decision opens up a wide range of new development opportunities— for both the University and the City of Providence.

INCREASING THE PAYOFF FROM UNIVERSITY RESEARCH

Although Rhode Island has fared well in recent years in the transition to a knowledge-based economy—especially when compared with other old industrial areas—the state is not yet as successful as it could be in translating its impressive concentration of scientific research into new businesses and new jobs. Realizing more fully the economic potential of its scientific base will require the collaborative efforts of many players, including universities and other research institutions, state and local governments, the business community, and others.

Because the progression of new technologies from the lab to the marketplace can often take five years or more—especially in the life sciences—the growth of Brown's research enterprise since 2000 should during the next five years begin to produce an increase in commercial activity. At the same time, Brown's increased emphasis on technology transfer and entrepreneurship should increase the "productivity" of University research—that is, the number of licensing agreements, new start-up companies, private investment, and jobs ultimately derived from any given level of research activity. With the cooperation of state and city officials, other research institutions, and the

private sector, Brown should thus be able to increase the creation of new businesses and jobs rooted in University research.

CLOSER TIES TO THE COMMUNITY

Finally, as Brown continues to deepen its ties with the surrounding community, both the University and the city should benefit. Stronger partnerships—with the city itself, with other institutions and community organizations—can help make both Brown and Providence more attractive to the talented people on whom their shared future depends. The results are already visible—in Brown's recent success in attracting some of the nation's top researchers, and in the growing numbers of Brown students who are choosing to stay in Providence after graduation.

TO COMPETE MORE EFFECTIVELY—COLLABORATE

Brown has in recent years been a major contributor to Rhode Island's success and to the ongoing revitalization of Providence. It can contribute even more in the future. But at the same time, Brown's continued success requires the active cooperation and support of both the city and the state.

In an era in which human and intellectual capital are the primary sources of competitive advantage—in which cities and states compete for the most talented workers and innovative ideas—the future will belong to the communities, businesses, and institutions that collaborate most effectively.

Notes

- 1 U.S. Census Bureau
- 2 U.S. Census Bureau
- 3 Alliance for Science and Technology Research in America
- 4 Harvard Business School, ISC
- 5 Rhode Island public colleges and universities include: the Community College of Rhode Island, Rhode Island College, and the University of Rhode Island. Private colleges and universities include: Brown University, Bryant University, Johnson & Wales University, New England Institute of Technology, Providence College, Rhode Island School of Design, Roger Williams University, and Salve Regina University
- 6 Rhode Island Labor Market Information website
- 7 Approximately 83 percent of all regular Brown employees worked full-time. US Census, American Community Survey, Table B24041
- 8 Full-time equivalent, FTE, is a unit of measure which is equal to one filled, full time position
- 9 Income paid to students is excluded, because it will be captured in the multiplier impact of their spending.
- 10 City Property Tax estimated from the model.
- 11 Florida, Richard. "The Role of the University: Leveraging Talent, Not Technology." *Issues in Science and Technology*, Summer 1999, pp. 67-73.
- 12 Moretti, Enrico. "Estimating the social return to higher education: evidence from longitudinal and repeated cross-sectional data." *Journal of Econometrics* 121 (2004) pp. 175-212.
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- 14 Florida, Richard. "Competing in the Age of Talent: Quality of place and the new economy." A Report Prepared for the R. K. Mellon Foundation, Heinz Endowments, and Sustainable Pittsburgh, January 2000, p. 48.
- 15 Committee for Economic Development, *America's Basic Research: Prosperity through Discovery* (New York, 1999), p. 2.
- 16 Shane, Scott. *Academic Entrepreneurship: University Spinoffs and Wealth Creation*, (Cheltenham, Edward Elgar, 2004).





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