

# DURHAM AND DUKE

AN ANALYSIS OF DUKE UNIVERSITY'S  
ESTIMATED TOTAL ANNUAL ECONOMIC IMPACT  
ON THE CITY AND COUNTY OF DURHAM

**\$2.6 BILLION**

Duke University Economic Impact

Year 2003 Report

Office of Public Affairs

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# INTRODUCTION

I am pleased to present the third in a continuing series of reports to the people of Durham on Duke's economic impact in our host community. Like its predecessors, published in 1997 and 2000, this document charts the major categories of university expenditures, determines which affect Durham, and conservatively estimates Duke's total annual economic impact during fiscal year 2002-2003 on the city and county of Durham. That impact, estimated at more than \$2.6 billion, is impressive however one looks at it. Duke is the largest employer in the county and paid \$732 million in wages to Durham residents. Duke leases about a third of the office space in Durham. Expressed as a percentage of retail sales, another measure of local economic health, Duke-related expenditures total about a third of Durham's total activity.

This report provides further evidence that major research universities such as Duke are economic engines whose activities dramatically benefit their hometowns and regions. Just as the annual *State of Durham's Economy*, produced by Durham's Office of Economic and Employment Development and other organizations, reviews economic and demographic trends that shape our community, this report adds another dimension to our understanding of Durham's economic health and prospects, and Duke's contributions to the vitality of our community.

Universities such as Duke and cities such as Durham affect and depend on one another in complex ways. It is important to us at Duke that Durham sustains its prosperity and continues to improve the quality of life for all its citizens. We believe it is important to Durham that Duke continues to thrive and proceeds on its clear leadership trajectory in American higher education. We are blessed in that regard, I believe, because Duke's growth in quality and international reputation – in research, medical care, and education – expresses a dynamic faculty and institutional character that historically has helped make Durham a wonderful place to live and work.

Duke University takes seriously the degree to which the university's and the city's fortunes are intertwined. The Duke-Durham Neighborhood Partnership, a far-reaching collaboration with 12 nearby neighborhoods and seven public schools, is now in its seventh year and has become a national model for university-community partnerships. Our partners in the West End and Southwest Central Durham neighborhoods are seeing progress through such collaborations as the Lyon Park Clinic, which opened in 2003 to expand health care services in the low-income neighborhoods, and the after-school programming in local community centers and churches with help from a \$2.25 million grant from the W.K. Kellogg Foundation. The Self-Help Community Development Corporation, with help from a \$2 million affordable housing loan from Duke, completed the renovation of its 50th house in the Walltown neighborhood in 2003, thus expanding housing opportunities for low-income residents. Student performance in Duke's partner schools has improved, in part from concentrated efforts by Duke tutors. In addition, Duke has helped schools such as E.K. Powe Elementary build a science resource center. George Watts Elementary School has a new drainage system and the Durham School of the Arts has a freshly paved running track, thanks to Duke's efforts at motivating its contractors to donate to the Neighborhood Partnership.

Duke has also been increasingly active in efforts to revitalize downtown Durham, supporting important projects such as Blue Devil Ventures, Diamondview, and the American Tobacco Campus. Our collaborations with the Durham Police Department have never been stronger. Our world-class Duke University Health System continues to be a principal component of Durham's role as "The City of Medicine," providing many millions of dollars in uncompensated care for those most in need in our community.

This will be my last report to you in this capacity, but I want to assure you that my successor, Richard Brodhead, and the Duke University Board of Trustees are very committed to continuing the university's engagement with Durham. I have been proud to be both a resident of Durham and Duke's president at a time when our interdependence and mutual welfare have become increasingly understood and valued. No report can capture the spirit that animates the relationship between Duke and Durham. We have attempted, however, to identify those aspects that can be quantified. It is my pleasure to introduce this report as one means of celebrating a relationship that grows stronger every year, a relationship that recognizes that Duke and Durham are seamless communities contributing to the betterment of both.



Nannerl O. Keohane  
President

# ECONOMIC IMPACT HIGHLIGHTS: YEAR 2003 REPORT

## TOTAL ESTIMATED ANNUAL IMPACT: \$2.6 BILLION

This is a conservative estimate based on impact studies prepared by federal and state agencies and other organizations. The 1:1 multiplier employed doubles expenditures to measure impact and is at the low end of multipliers (some of which triple expenditures) used by other universities.<sup>1</sup>

## EMPLOYMENT: \$1.46 BILLION

Duke is the largest employer in Durham County and the third largest private employer in North Carolina.<sup>2</sup> In fiscal year 2002-2003, Duke employed 18,343 Durham residents out of its total work force of 35,201, or about 15 percent of employed persons who reside in Durham County.<sup>3</sup>

Durham residents earned \$732 million in wages and benefits. Duke attracts a highly skilled work force to the campus and to Triangle firms. Expenditures create jobs: a national study using U.S. Commerce Department data conservatively suggests Duke's record \$365 million in research funding in fiscal year 2002-2003 was responsible for creating more than 13,300 jobs in the area.<sup>4</sup>

## PURCHASING: \$366 MILLION

Purchases in Durham County totaled \$171 million in 2002-2003, and 632 individual non-government Durham vendors sold at least \$10,000 in goods and services to Duke, an increase of 200 since the 2000 report. In addition, Duke leases about a third of the office space in Durham.<sup>5</sup> Duke paid about \$12 million in leases on 800,000 square feet of property, which generated an estimated \$1.5 million in property taxes payable to Durham.<sup>6</sup>

## DONATIONS: \$102 MILLION

Duke and its community provided at least \$51 million in donations of various kinds in fiscal year 2002-2003. Duke University Health System provided \$48 million worth of uncompensated medical care for Durham County residents. Through various means, the university and its community members donated \$3 million to Durham nonprofit organizations.

## STUDENT AND VISITOR SPENDING: \$634 MILLION

Duke's 11,700 students spent an estimated \$89.5 million off campus. According to the Durham Convention & Visitors Bureau, visitors to campus spent an estimated \$227 million in our community.

## SERVICES, TAXES AND FEES: \$38 MILLION

Duke relieved the city of a cost burden by providing \$14 million for municipal type services, such as the Duke Police Department. If Duke had not provided this type of service, the city would have had to assume the responsibility. Additionally, Duke paid \$5.4 million in taxes and fees in fiscal year 2003 on Duke-owned properties not used principally for educational purposes.

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<sup>1</sup> See Methodology section for multiplier explanation. Also, N.C. State University published an economic impact statement in 2001 which used a multiplier of 1.39 <[www.ncsu.edu/univ\\_relations/news\\_services/NCSUecononimpact.html](http://www.ncsu.edu/univ_relations/news_services/NCSUecononimpact.html)>

<sup>2</sup> Duke University is the state's third largest private employer, after Wal-Mart and Food Lion, according to the N.C. Employment Security Commission. <<http://jobs.esc.state.nc.us/lmi/largest/top10ten.htm>>

<sup>3</sup> Duke Corporate Payroll Services.

<sup>4</sup> Association of American Universities, Employment Impacts of Academic R&D Fiscal year 2000 North Carolina, as determined by the U.S. Commerce Department's Bureau of Economic Analysis.

<sup>5</sup> Cannon, Steve. "Duke Leading in Durham," *The News and Observer*, July 28, 2003.

<sup>6</sup> Office of Real Estate Administration, Jeffrey Potter.

# TOTAL ESTIMATED ANNUAL ECONOMIC IMPACT

EXPENDITURE	DIRECT	ESTIMATED TOTAL IMPACT
EMPLOYMENT <sup>1</sup>	\$ 732,000,000	\$ 1.46 Billion
PURCHASING	\$ 183,000,000	\$ 366,000,000
SERVICES	\$ 19,000,000	\$ 38,000,000
<i>Taxes and Fees</i>	\$ 5,000,000	
<i>Duke-Provided Services</i>	\$ 14,000,000	
DONATIONS <sup>2</sup>	\$ 51,000,000	\$ 102,000,000
<i>Unrecovered Medical Costs<sup>3</sup></i>	\$ 48,000,000	
<i>Recurring Contributions</i>	\$ 3,000,000	
STUDENT AND VISITOR SPENDING	\$ 317,000,000	\$ 634,000,000
TOTAL IMPACT	\$ 1.3 Billion	\$ 2.6 Billion

<sup>1</sup> Data pertain to Durham residents and were compiled by Duke Payroll Services.

<sup>2</sup> Estimated donations of funds, services and/or goods from Duke organizations and individuals.

<sup>3</sup> Duke University Health System care of county residents for which Duke was not compensated.

# DUKE UNIVERSITY'S ESTIMATED TOTAL ANNUAL ECONOMIC IMPACT ON THE CITY AND COUNTY OF DURHAM

This study concludes that, stated conservatively, Duke University's estimated total annual economic impact on the city and county of Durham was \$2.6 billion in fiscal year 2002-2003. Actual Duke-related expenditures represented 29 percent of the city of Durham's more than \$4.5 billion in retail sales,<sup>1</sup> which is one measure of local economic activity.

The university's total annual economic impact on Durham is the result of a calculation based on the sum of certain direct and indirect benefits and a multiplier. Durham benefits from direct university spending for employment, goods and services, taxes and fees, donations, and uncompensated medical care provided by the Duke University Health System for Durham County residents. Indirect benefits result from spending in the city and county by others, such as students and campus visitors.

Duke University's fiscal year 2002-2003 budget of nearly \$2.5 billion directly affected Durham. The 18,343 residents who worked last year at Duke earned \$732 million in gross wages and benefits. Duke purchased \$171 million in goods and services from local businesses and individuals. Duke paid the city/county \$5.4 million in direct payment of taxes and fees, including \$1.6 million in city sales taxes. Duke University Health System contributed more than \$48 million in uncompensated health care to Durham County residents. The university spent \$14 million to provide services, such as \$6.7 million for police functions. The city would have to provide services such as police protection if Duke did not. In addition, the Duke community donated more than \$2 million to community organizations and charities.

Duke's indirect economic impact also was striking. Duke students, their families, and campus visitors spent an estimated \$317 million in Durham for food, lodging, and other local goods and services.

The following sections of this report consider the principal forms of economic impacts in detail:

## EMPLOYMENT

Duke is the largest employer in Durham County, the largest private employer in the Research Triangle area, and the third largest private employer in North Carolina. In 2002-2003, Duke employed a total staff of 35,201 (including part-time, temporaries, and students in all areas, including Durham Regional Hospital and Raleigh Community Hospital) and paid a total of \$1.319 billion in wages and benefits.

Fifty-two percent (18,343) of Duke's employees were Durham residents. Those resident employees constituted about 15 percent of the county's total work force of more than 119,000.<sup>2</sup> They earned \$732 million in wages and benefits. In fiscal year 2002-2003, the mean salary was \$63,046 for employees paid monthly and \$36,571 for hourly paid staff.

## PURCHASING

Duke purchased an estimated total of \$811 million in goods and services in fiscal year 2002-2003. Of that amount, Durham County firms provided \$171 million in goods and services. Local purchasing of goods and services is dominated by transactions with small firms and individuals. Duke purchased at least \$10,000 in goods and services from 632 different, non-governmental vendors in Durham.

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<sup>1</sup> Gensic, Trisha. City of Durham. Retail sales figure.

<sup>2</sup> N.C. Employment Security Commission Labor Force Statistics.

Duke has made several other special purchasing arrangements: The Minority/Women-Owned Business Program directed 2.4 percent of university business to minority-owned and women-owned vendors in Durham. As a result, those Durham firms sold about \$3.4 million in goods and services to Duke in fiscal year 2002-2003. Vehicle purchasing is done with several Durham dealers through an arrangement with the manufacturers. The fleet totals 681 licensed vehicles, including 32 buses that consumed 181,000 gallons of fuel in 2002-2003. During this period, Duke made purchases of light trucks and cars totaling \$1.4 million.

Duke also leases a considerable amount of space in Durham.<sup>1</sup> As of June 30, 2003, that amounted to about 800,000 square feet at a total estimated cost of \$12 million a year. That number does not include the space Duke plans to lease in the American Tobacco renovation and the new Hock Plaza on Erwin Road.

### **Construction**

Construction is a major and on-going purchasing category at Duke, although the level of expenditure varies by year. The direct impact includes wages paid to workers, purchase of equipment and supplies, as well as fees for architects and other professional services. Duke spent \$188 million for construction in fiscal year 2002-2003, including \$97.3 million in new construction contracts and \$22.6 million for professional architecture and design services. It is difficult to determine all impacts specific to Durham because out-of-county vendors may or may not employ Durham residents or purchase supplies in Durham.

## **DONATIONS**

Duke and its community provided at least \$102 million in donations of various kinds in fiscal year 2002-2003.

### **Uncompensated Care**

Duke University Health System provided \$48 million in uncompensated care for Durham County residents, an amount that represents substantial cost avoidance on the part of the county.

## **DUKE UNIVERSITY HEALTH SYSTEM UNCOMPENSATED CARE**

	<b>FY2003</b>
Durham County charity care	\$ 15,835,000
Durham County unrecovered costs <sup>2</sup>	25,563,000
Other donations*	6,723,000
<b>Total uncompensated care</b>	<b>\$ 48,121,000</b>
<i>*Other donations</i>	
<i>In-kind donations to Lincoln Community Health Center</i>	<i>2,629,000</i>
<i>Direct support to Lincoln Community Health Center</i>	<i>2,100,000</i>
<i>Direct support to Emergency Medical Services</i>	<i>1,500,000</i>
<i>Promising Practices<sup>3</sup></i>	<i>340,000</i>
<i>Duke University Affiliated Physicians (DUAP) paid physician expense at Lincoln Community Health Center</i>	<i>154,000</i>
	<b>\$ 6,723,000</b>

<sup>1</sup> Cannon, Steve. "Duke Leading in Durham," *The News and Observer*, July 28, 2003. "While office and apartment construction elsewhere is at a standstill, Durham is home to some of the state's biggest construction projects, and there is a common thread that helps developers justify building. 'It really all boils down to Duke,' said Jim Anthony, president of Anthony Allenton Commercial Real Estate in Raleigh and a 1976 Duke grad. 'Whether or not Duke is the one paying the rent is irrelevant; they are so big they bring activity.' ... Other midsize cities can depend on locally based banks and corporations to keep workers in the city's core and stimulate growth. In Raleigh, Progress Energy is backing a downtown project that will build a new office tower with 400,000 square feet of office and retail space. Lacking a Fortune 500 company, Durham has come to depend on Duke."

<sup>2</sup> Care that was billed but not paid.

<sup>3</sup> Sent nurse practitioners to low-income neighborhoods to help residents manage asthma, diabetes and hypertension.



### **Recurring Contributions**

Through voluntary support and donations, both monetary and in-kind, Duke contributed more than \$3 million to the Durham community last year. The accompanying chart notes annually recurring donations, some of which are estimated. Student donations to Durham organizations, for example, may be estimated on the basis of a study that listed more than \$80,000. Forty-four Durham residents received financial aid as Duke undergraduates last year.

In addition to annual contributions, some contributions are made as part of special initiatives that are meant to have a sustained impact on the community. For example, Duke is engaged in boosting student achievement in the public schools, encouraging home ownership, providing senior and youth programs, and reducing crime throughout the Duke-Durham Neighborhood Partnership. The NP, endorsed in 1994 and again in 2001 by the Board of Trustees, focuses on forming partnerships to improve the quality of life in 12 neighborhoods and seven public schools near Duke. Duke raised \$10 million during the university's Campaign for Duke to support this effort, which concentrates on priorities identified by residents as important. In 2002, for instance, Duke and N.C. Central University received a \$4.5 million grant from the W.K. Kellogg Foundation to provide after-school and summer programming for at-risk youngsters in Durham. Duke established an Office of Community Affairs designed in part to coordinate Duke/public school/neighborhood interactions on a long-term basis.

To help stabilize the neighborhoods, Duke has invested \$4 million in an affordable housing loan with the Self-Help Community Development Corporation. The results of that initiative continue to be felt by new homeowners in Walltown and Crest Street, by borrowers of lower rate mortgage loans, and by those assisted through a \$250,000 line of credit for Habitat for Humanity. In 2003, Self-Help completed the renovation of the 50th house and homeownership increased from 20 percent to 26 percent between 1990 and 2000, according to census figures. Moreover, \$1 million of the Duke investment supported Self-Help's Community Advantage Program, which has provided over \$1 billion of home loans to North Carolina low-income homebuyers.<sup>1</sup>

## **ANNUAL RECURRING CONTRIBUTIONS**

### **INSTITUTIONAL**

Financial Aid to Durham Students	\$	699,000
Duke Endowment grant to Duke-Durham Neighborhood Partnership <sup>2</sup>	\$	400,000
Community Service Center	\$	304,000
Auxiliary Services	\$	25,000
Office of Information Technology	\$	89,000
Food Drive	\$	13,000
Durham Health Partners	\$	43,000

### **INDIVIDUALS**

Student Donations	\$	80,000
Duke-Durham Campaign <sup>3</sup>	\$	223,000
United Way	\$	1,200,000
<b>TOTAL</b>	<b>\$</b>	<b>3,076,000</b>

<sup>1</sup> Calhoun, Michael. Self-Help Community Development Corporation.

<sup>2</sup> This grant varies from year to year but has provided a total of more than \$3 million to partnership organizations since 1996.

<sup>3</sup> Local business people solicit their colleagues for donations to the Duke-Durham Neighborhood Partnership.

## STUDENT AND VISITOR SPENDING

Durham receives additional but indirect benefits as a result of Duke University's programs and activities. Student spending and visitor spending off-campus constitute the most significant impact. They are estimated to exceed \$300 million annually.

### **Student Spending**

Duke's 11,700 undergraduate and graduate/professional students spent annually, by conservative estimate, \$89.5 million. This estimate is based on budgets established by financial aid officers at Duke for the several categories of students, including undergraduate, graduate, and professional, and is adjusted to reflect non-university housing and other spending factors. About 11 percent of undergraduate students and the great majority of graduate and professional students (96%) live off-campus and pay rent for non-university housing.

	Per Student Expenditures	Number of students	Total Spending
Undergraduate students			
On-campus	\$ 1,615	5395	\$ 8.7 million
Off-campus	\$ 9,825	700	\$ 6.8 million
Graduate & Professional Students			
Off-campus	\$ 13,000*	5,689	\$ 74 million
			<b>\$89.5 million</b>

*\*Estimate derived from figures provided by The Graduate School, School of Law and School of Nursing.*

### **Visitor Spending**

Duke was the most common destination of the five million visitors to Durham in fiscal year 2000, according to the Durham Convention & Visitors Bureau. (This is the most recent survey conducted by the DCVB.) Visitors came for medical and other university-related purposes and stayed either the day or overnight. A visit to Duke was reported a key activity for many who came to Durham for other primary purposes, the Bureau reports. The Durham Convention & Visitors Bureau estimates that Duke visitor spending amounted to \$227 million in 2003.

## SERVICES, TAXES AND FEES

Duke paid taxes and provided services, such as a campus-based police department and maintenance of 15 miles of roadway, which totaled about \$19 million in fiscal year 2002-2003. The city thereby is relieved of a substantial cost burden. If Duke did not provide such services, the city would have to assume the responsibility.

### **Duke-Provided Services**

While Duke is served in many ways by Durham, the university annually provides for itself a number of municipal-type services. Those services cost \$14 million. The university paid \$6.7 million for its police department and staff of 143, including 60 sworn officers, to protect and serve students, employees, and visitors, including Durham residents. Duke police traveled 503,000 miles on patrol and wrote approximately 6,000 incident reports. Starting in 2004, Duke will pay an additional \$300,000 a year for five new police officers to complement the Durham Police Department's crime reduction efforts by patrolling in neighborhoods adjacent to campus.

In addition to police protection, Duke provided its own water and sewer infrastructure and a campus bus system that operated a fleet of buses for a total of about 66,000 hours last year. Duke also maintained 15 miles of private roads that are open to the public. This study uses the lowest road maintenance cost estimates, which include snow and ice removal expenditures that have fluctuated by as much as \$200,000 in recent years.

## DUKE-PROVIDED SERVICES

Police protection	\$ 6,700,000
Road maintenance	\$ 409,000
Water/sewer operation & maintenance	\$ 500,000
Mass transit	\$ 5,100,000
Trash collection and recycling	\$ 1,300,000
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TOTAL	\$14,009,000

## TAXES AND FEES

Direct taxes and fees paid to Durham in fiscal year 2002-2003 totaled \$5.4 million in property taxes, water and sewer fees, landfill tipping fees, storm water fees, privilege licenses, motor vehicle taxes, and city sales taxes.<sup>1</sup> Duke paid \$336,000 in taxes for properties including the Washington Duke Inn, a hotel owned by the university.

Indirectly, Duke also contributes to the tax base. The Trinity Heights Homesites, 40 homes and townhomes that were built on Duke property to sell to faculty and staff in 2001, add an estimated \$100,000 a year in property taxes.<sup>2</sup> This is property that could have been developed for institutional use and thus been tax-exempt. Duke also rents much space in Durham buildings. A conservative estimate is that the owners of those buildings are paying about \$1.5 million a year in property taxes, based on the Duke leases. Neither of these indirect tax estimates are included in the totals for this impact report, which is why, in part, this report is a conservative estimate.

## ACTUAL TAXES AND FEES

*(Combined city and county)*

Property taxes	\$ 336,000
Water and sewer fees	\$ 2,700,000
Landfill fees	\$ 403,000
Storm water fees	\$ 145,000
Fire inspection & permitting fees	\$ 45,000
Motor vehicle taxes	\$ 122,000
Sales taxes	\$ 1,650,000
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TOTAL	\$ 5,401,000

*Numbers rounded to nearest \$1,000.*

<sup>1</sup> Office of Real Estate Administration, Jeffrey Potter and Office of Financial Services.

<sup>2</sup> Office of Real Estate Administration, Jeffrey Potter.

## CONCLUSION

Like other major research universities, Duke is an economic engine whose activities and health have a dramatic impact on the local economy. This report looks at the most important elements and estimates Duke's total annual impact on Durham at \$2.6 billion.

The estimated impact is based on data from a variety of sources from both Duke and Durham. The principal elements are university expenditures totaling \$985 million (for wages of Durham residents, local goods and services, taxes and fees and donations such as for uncompensated hospital care) and \$317 million in local spending by students and visitors.

Beyond economics, the study observes, a university like Duke is a source of benefits that are difficult, if not impossible, to quantify. For example, it is a source of intellectual and cultural stimulation, entertainment, and recreational opportunities that are available to all residents of Durham.

Finally, it should be stated that this study is based on a fundamentally important assumption: the Durham/Duke relationship is most likely to thrive through a sustained partnership. It is widely recognized that it is important to Durham that Duke continue to be a strong and vibrant center for education, for research, and for service in such fields as law, business, divinity, and — in this City of Medicine — in medical care.

The university enjoys excellent health today and continues to plan strategically to ensure its vitality in the years to come. A sustained partnership between Durham and Duke will greatly strengthen collective efforts to improve the lives of Durham residents.

# LEADERSHIP IMPACTS: THE IMPACTS OF A MAJOR RESEARCH UNIVERSITY

## NOTES ON OTHER IMPACTS

### *Leadership: Community and Industry*

Duke University is above all else a major research university known internationally for quality in education, research, and service. Durham, and for that matter the Triangle and North Carolina, benefit greatly, often in ways that cannot be quantified, from the university's presence and sustained health. For example, while it is a fact that almost 5,400 of its graduates – including holders of Duke bachelor, master, professional and doctoral degrees – live in Greater Durham, it is difficult to quantify their contributions and support of local schools, churches, social and cultural organizations, and charitable activities. But we know that they and many others of the 5,800 Duke alumni living elsewhere in the Triangle are among the estimated 40,000 persons who create and lead firms or are employed in Research Triangle Park, which has grown to be one of the most competitive and successful technology centers of its kind in the country.

Similarly, while an estimated 75 percent of all Duke students volunteer services to the Durham community in the course of their time at Duke, no one has estimated the total number of hours of work performed. Nor has anyone calculated the economic value (even at the minimum wage) of their free labor as community volunteers, whether in organization such as Habitat for Humanity or tutoring students in one of our Durham/Duke partnership schools in the public school system.

Nationally, it is clear that research universities such as Duke are increasingly important to the evolving economy. Increasingly, industries and firms that are successful competitors here and abroad for business and jobs are knowledge-based, high-tech, and engaged in cutting-edge research. Duke's presence in the Triangle, beyond its role in establishing the Research Park, helps sustain the area's leadership drive and entrepreneurial spirit. For example, Duke researchers from the Pratt School of Engineering are leading the newly established Center

for Biologically Inspired Materials and Material Systems are working with industry and government collaborators on the enabling science to create such devices, including locomotion, and actuation for robotics in the aeronautics, marine, defense, and space industries; miniature and functionally complete mechanical systems for integration with silicon electronics; and surgical and endoscopic devices for the medical industry.

Another team of Duke researchers, led by neurobiologist Miguel Nicolelis, has taught rhesus monkeys to control, consciously, the movement of a robot arm in real time, using only signals from their brains and visual feedback on a video screen. This achievement represents an important step toward technology that could enable paralyzed people to control "neuroprosthetic" limbs and even free-roaming "neurorobots" by using brain signals. Members of the research team--neurobiologists and biomedical engineers--say the technology they developed for analyzing brain signals from animals could also greatly improve rehabilitation of people with brain and spinal-cord damage from stroke, disease, or trauma.

Experts at Duke are applying their research expertise, particularly in health-related matters, to our nation's defense. Duke was recently selected as the site for a \$35 million grant from the federal Department of Homeland Security to be a national center for protection against bioterrorism. Duke engineers are heading a national consortium devising new technologies to detect land mines and to protect our soldiers in Iraq and Afghanistan.

Expenditures resulting from research funding at Duke cycle through the Durham and state economies, transforming federal funds into revenue for our residents and businesses. In North Carolina, according to the U.S. Commerce Department's Bureau of Economic Analysis, 36 jobs are created for every \$1 million spent in academic research.<sup>1</sup> The jobs are created on and off campus and include both full and part-time positions. Nationally, academic R&D expenditures by doctorate-granting institutions total \$29.6 billion includes R&D supported by nonfederal sources created about 1.08 million jobs in 2000, the most current data available, according to a study by the Association of American Universities. In this context, it is important to note that Duke is competing successfully for research funding from all sources, both federal and private. Using the AAU formula, Duke's 2002-2003 sponsored research of \$365 million generated 13,140 jobs.

<sup>1</sup> Association of American Universities Employment Impacts of Academic Research and Development Fiscal year 2000 for North Carolina, as determined by the U.S. Commerce Department's Bureau of Economic Analysis.

### **Leadership: Medical**

More than a third of Durham employees work in a health-related business, up from a quarter in 1981. Duke University Health System employs about 7,000 Durham residents and is the largest Durham health-related employer, followed by Glaxo Wellcome and Blue Cross/Blue Shield of North Carolina.<sup>1</sup> At Duke University Health System in 2002–2003, total expenditures for salaries and compensation were \$631 million and total operating expenses were \$1.3 billion. DUHS was staffed by approximately 2,050 physicians (83 percent of whom were board certified). Research funding totaled more than \$405 million, of which about \$241 million was awarded by the National Institutes of Health (NIH). Also the more than 2,000 nursing and medical school students, residents, and house staff provided millions of dollars of care to indigent residents of Durham and the state of North Carolina. (Precise data have not been developed.)

## **AIDING COMMERCIALIZATION OF NEW TECHNOLOGIES**

Duke's Office of Science and Technology is dedicated to helping corporations to develop productive relationships with Duke and to assist university inventors in the development of their technologies. Since the office was created in 1992, three mid-size and twelve technology based companies have been formed in the Research Triangle area based on Duke technology.<sup>2</sup> This has translated to creation of about 400 jobs with an average salary in the \$50,000/year range. There are three new Durham-based companies in development.

Transfer of technology and corporate interaction has also accelerated. We are now averaging about \$4,000,000 per year in licensing revenue, 70 new patent applications, 40 issued US patents, 50 licenses, and over \$100,000,000 of commercially sponsored research. This is a roughly three-fold increase in all categories over the past decade.

## **ACKNOWLEDGEMENTS**

The origins of the initial 1997 study, and the two subsequent ones, may be traced to the work of student members of a master class at Duke's Terry Sanford Institute of Public Policy, directed by Professor of the Practice Richard A. Stubbing. The design, methodology, and format of the original document were further shaped by the

assistance of three economists in addition to Professor Stubbing: Professor Charles Clotfelter and Professor Helen F. Ladd, both from the Sanford Institute at Duke University, and Michael Walden, professor of economics at North Carolina State University, who is the author of a number of highly regarded impact studies. It was Professor Walden who suggested an appropriate way to express the Duke-Durham relationship in terms of economic activity: Calculate direct Duke-related expenditures as a percentage of Durham's annual retail sales.

Staff members of a number of offices at Duke University contributed data presented in this report. Particular thanks are due to Beth Whitfield of The Office of Financial Services, who gathered information from many sources. John F. Burness, senior vice president for public affairs and government relations, commissioned this study. Susan Kauffman in Duke's Office of Public Affairs prepared the report, with the editorial assistance of Michelle Hurtado, a member of the Class of 2004.

## **METHODOLOGY**

Duke University's annual total economic impact on the city and county of Durham may be significantly greater than the total estimated in this report. There are two principal reasons for this. First, this study, like its predecessors, incorporates the most conservative data available. Second, this report, as in 1997, employs a conservative 1:1 "multiplier," the smallest of the conservative ratios used in mathematical models nationally to measure an institution's economic impact on a city or region. (The multiplier is based on the fact that dollars put into an economy by an institution are spent more than once. For example, each dollar in salary paid to an employee is spent by that employee and again by the first recipient of that employee's dollar.) Typically, impact models use a multiplier of 2:1 (or greater), meaning that every \$1 spent by a university is then spent twice more by others leaving the area under study – thus tripling the impact of the initial dollar. The 1:1 multiplier used in this study simply doubles the value of the initial dollar entering the Durham economy. This is done to avoid overstating certain impacts, particularly of those estimated "indirect" impacts such as student and visitor spending in Durham.

This study also references the multiplier commonly adopted to estimate the impact of expenditures on employment outside the university. In a 2002 study, for example, the University of North Carolina at Chapel Hill concluded that 38.61 external jobs are created for every \$1 million in university spending.

<sup>1</sup> <http://www.durhamchamber.org/business/employers.html>

<sup>2</sup> Taber, Robert. Duke University Health System's Office of Science and Technology.

## NOTES

For purposes of this report, university expenditures in most cases are based on fiscal year 2002–2003. This assessment uses a spending 1:1 multiplier which assumes that, on average, a dollar spent by the university, its students, or its visitors is spent at least one more time before leaving the Durham economy. Some dollars, of course, turn over many times before leaving Durham and North Carolina and others leave immediately. This study does not attempt to estimate a major secondary impact—spending by university employees. Employee spending, however, does start a second round of expenditures initiated by the university's payroll. The multiplier most commonly used doubles this spending to estimate impact, according to Elliott, Levin, and Meisel. (See Sources.)

University spending within Durham includes estimated purchases, salaries of employees who are residents, and their benefits. Data are provided by Duke University's Office of Financial Services and Office of Human Resources.

In order to estimate student spending beyond the university on items related to Duke University attendance, this study utilized 2002–2003 enrollment data. Relevant budget allowances for expenses other than tuition, fees, and university housing and board plans, and estimates based on numbers of students living off-campus, were then factored into the calculation. The calculations were based on student budgets prepared by the Office of Undergraduate Financial Aid, the Graduate School and various professional schools, with the assistance of the Durham Convention & Visitors Bureau. Graduate student expenditures are significantly higher than those of undergraduate students in order to reflect off-campus rent. The total estimated student expenditures figure may be low because it does not include spending in the summer months by undergraduates. Nor does it include entertainment expenditures.

Regarding employment, a Cleveland State University economic impact study (1992) uses an employment multiplier of 40 external jobs created for every \$1 million spent in the local economy. The University of Minnesota (1992) estimated that 45 external jobs are created for every \$1 million spent in its local economy. The employment multiplier used by the University of North Carolina at Chapel Hill in its 1992 study was 38.61. The multiplier for calculating the employment impacts of academic research and development is 35.1, meaning 35 jobs are created for each \$1 million in R&D funding spent in

1999. That multiplier was derived from state-specific multipliers developed by the U.S. Commerce Department's Bureau of Economic Analysis, as reported by the Association of American Universities.

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