

# THE GRADUATE SCHOOL STRATEGIC PLAN 2006: *TRANSITION TO A NEW LEVEL OF EXCELLENCE*

## I. INTRODUCTION

### A. *An Overview of Graduate Education Today*

Research-based graduate education (i.e., at the level of the Ph.D. and research Masters degrees) has existed in the United States for more than 120 years. It has become a key component of the mission of research universities to advance the limits of knowledge, to train future leaders in academe and other professions, and to expand the intellectual and technological horizons of society as a whole. It serves as a major source of intellectual ferment for faculty and all students at the university itself. As we confront the challenges of the global society of the 21st century, research-based graduate education has only increased in importance as an engine of economic, social and intellectual advancement. More baccalaureate students than ever are going on for graduate degrees, more employers are requiring advanced training of employees, and the expansion of knowledge within and between disciplines is requiring more study than ever before to solve important problems

Today graduate schools must accommodate a much more diverse population of students than ever before. There are more international students, more women, more students from historically underrepresented groups, more students with young children, and more individuals who increasingly do not fit the traditional model of a full-time, residential student. There is more demand for programs that defy the traditional boundaries of disciplines and departments, for programs involving scholarship that is what has traditionally been classed as “applied” rather than “basic”, and for programs geared to the needs of specific clienteles. Electronic technologies have transformed the ways in which we can respond to those clienteles and to our own internal needs (e.g., the processing of applications) and the ways in which we can access and publish scholarship.

Federal research funding is highly competitive and comes with ever more stringent accountability requirements and oversight. There is increasing demand for services specifically geared to the needs of graduate students, such as child care, professional development, placement counseling, etc., and a new emphasis on developing the communication and teaching skills of students prior to graduation. There is an increasing emphasis on the collection of data at both the institutional and national levels that might help us understand the causes of and address the problem of the high rate of attrition from doctoral programs before degree attainment, as well as the increasing length of time it takes to achieve the Ph.D. in most disciplines. Also, as tuition, stipend, and health insurance costs continue to rise in an environment of strong competition between institutions for students of high quality, financial aid for graduate students has become both increasingly important and difficult for institutions to provide without severely restraining other activities that are critical to graduate training, such as faculty development, physical facilities, information resources, etc.

It is to deal with these types of challenges that the administrative units that we term “graduate schools” were created at American universities. At Duke, the Graduate School has been given a place of prominence and special support by the faculty and administration, and an organizational structure and resource base that put it in a strong position to fulfill its missions of providing the

future intellectual leaders of society, of developing new knowledge, and enhancing the intellectual life of faculty and other students at the university itself. The support given to its Graduate School by Duke University has enabled it to provide strong leadership to the improvement of graduate education in the nation as a whole.

The present document is being put forth at a time of transition for the Graduate School. Lewis Siegel is retiring after 15 years as its dean, a period in which the Graduate School at Duke has undergone a major transformation, and in which innovations in graduate education and its administration put into place at Duke have become known and copied throughout the nation. The Graduate School can look forward to fresh and excellent leadership from its incoming dean, Professor Jo Rae Wright, who has shown a passion for high quality graduate education and great concern for the welfare of graduate students in her role as Vice Dean for Basic Sciences in the Medical School. In order to foster the transition and to provide information that might be useful to Dean Wright, this document is more than just a Strategic Plan. It attempts to describe the current state of the Graduate School and how that state was reached. It tries to lay out important challenges facing the School and possible ways in which those challenges can be met. And finally, it makes recommendations as to what the Graduate School might do to achieve a higher level of excellence in the future both at Duke and in the delivery of graduate education in the nation as a whole.

### **B. A Mission Statement**

Broadly speaking, the mission of the Graduate School of Duke University is to train the next generation of leaders in all professions that utilize the analytical skills derived from research-based graduate education. Though a substantial number of Duke Ph.D.s and Masters graduates do enter academia, the education that they obtain here is intended to be applicable to any job that involves the finding, creative application, and/or teaching of new knowledge. In addition, the Graduate School exists in large measure to support the research and educational missions of a faculty interested in the frontiers of knowledge, and, in so doing, to advocate for the primacy of scholarship throughout the university. With respect to higher education itself, Ph.D. education serves to train the next generation of scholars—researchers and teachers—who will be the faculty of the future. While at Duke, graduate students at Duke serve to strengthen the intellectual life of the university and the scholarly activities of our faculty. In addition to their role as associates in research, graduate students play a key role as teachers and as a bridge between the faculty and the undergraduate students at Duke. In presenting this plan, we consider two propositions to be axiomatic for a research university: 1) the best research-active faculty demand and need the best possible graduate students; and 2) the best graduate students will only come to a university that has an excellent faculty.

### **C. What are some of the specific functions of the Graduate School at Duke?**

Graduate Schools are unusual and somewhat amorphous entities. They work with faculty hired and financially supported by other schools, and they have little or no control over space or monetary resources beyond the amounts needed to support the graduate students and administer the graduate programs. Although its offices have a physical location in Allen Building, the Graduate School of Duke University is as much an idea as it is a School. It is called a School because it alone has been given the authority to award the Ph.D. and research Masters degrees in the name of this university. Research-based graduate programs exist in all of the Schools of the University, and the faculty who participate in those programs are hired by those schools to perform many duties other than simply participate in graduate education.

Yet Duke has chosen to see that graduate education is treated specially by establishing an administrative unit that is specifically dedicated to the well-being and the enhancement of Ph.D. and research-base Master-level education wherever the faculty and students participating in that educational experience are physically located. Why should this be so? What exactly is the role of the Graduate School in the university? More to the point, what does the Graduate School actually do, and what value added is derived from having an administrative entity focused on graduate education? Although there are many answers possible to these questions, the following may cover some of the most important issues:

----The Graduate School serves as an advocate for the need of graduate students to be students. Although graduate education and research are inseparable, academic research--particularly externally sponsored research--can sometimes become more responsive to its own priorities and interests (and those of funding agencies) than to the interests of good graduate education. Research topics can be too narrow, students treated as technicians or sources of inexpensive labor, and sometimes too little thought is given to fulfilling educational needs that will lead to future employability. Similarly, graduate students serve a key role in undergraduate teaching, and proper teaching experiences can be immensely beneficial to both graduate and undergraduate students. However, it is possible to overburden graduate students with teaching-related work, or with assignments that are repetitive and clerical in nature. In such circumstances, it is the role of the Graduate School to serve as advocate for the intellectual development of the graduate student as a student and to ensure that faculty serve as intellectual and professional mentors for graduate students, not simply as employers of student labor for teaching and/or research projects.

----The Graduate School, through its elected Executive Committee of the Graduate Faculty (ECGF), provides quality control for all aspects of graduate education. It establishes policies and standards that define good practice in all of its programs, high quality in curriculum, excellence in student selection, and rigor in faculty appointments. It works to maintain equity across all academic disciplines, seeing that there are minimum standards for each degree and for certificate programs, and it tries to assure that campus-wide and program-specific standards are being observed. The Graduate School constantly works with the faculty to define new graduate programs and forums for students and faculty that permit pursuit of knowledge and delivery of education of the highest quality at the frontiers of scholarship, often at the boundaries between existing disciplines.

----The Graduate School works to attract excellent students to work with its faculty. It must work incessantly to find the means to provide the financial support that is necessary to accomplish this goal. Financial aid is essential, particularly in Ph.D. programs, where the time to degree is long, and in which students must have some time free of service to take courses, do their research, and write their dissertations. In addition to working to expand the resources available to provide funding for graduate students, the Graduate School tries to ensure that the allocation of those funds across departments and schools is equitable and works to support the highest quality of student body possible for the university.

----The Graduate School is focused on pursuit of scholarship of the highest standard of quality, without regard as to where the students and faculty involved in such scholarly efforts are located within the university. In the face of strong pressures in each of the Schools to attend to other concerns, particularly financial ones, a university benefits from having a unit that is always centered on the primary academic issues of scholarship, curriculum, and research directions of faculty and students. The Graduate School also brings an institution-wide perspective to academic administration that is important in a relatively decentralized university. The Dean of the

Graduate School, with no control over resources for faculty slots, salaries, or space, has only the power of persuasion. He or she is more a political than an administrative force within the university. Yet, since the issues of graduate education and frontier scholarship of necessity cross all artificial boundaries, such as departments and schools, the graduate dean is regularly put in the position of trying to play the “honest broker” who is focused on academic quality and the best interests of the intellectual community. In acknowledgement of this special role, at Duke, the Graduate School Dean is given responsibility by the Provost for coordinating external reviews of academic programs, and by the faculty for advising the Provost on decisions concerning faculty appointment, promotion, and tenure.

----The Graduate School emphasizes the importance of adequately training future college and university teachers, although it recognizes that academic jobs are not the ultimate career outcomes for many, if not most, graduate degree recipients in many disciplines. Thus it advocates and works to support programs that train graduate students as excellent teaching assistants and instructors. Increasingly, it works with departments to provide graduate students with structured teaching experiences that are appropriate to their future careers.

----The Graduate School must play an active role in supporting those parts of the life of graduate students that are not precisely “academic” in nature, but are critical to successful completion of graduate training and a lifetime of work that can make good use of that training. Thus, the Graduate School works with career development programs and faculty, alumni, and employers to try to provide non-academic, as well as academic, job opportunities for recipients of graduate degrees. It works to promote the interests of graduate students in areas such as financial aid, housing, health care, counseling, child care, etc. Due to the highly individualized nature of graduate study, particularly research in doctoral programs, graduate school is too often a highly isolating experience, both socially and intellectually, for many students. It is important for the Graduate School to provide support and counseling for students and to provide venues for them to interact with one another both socially and academically across disciplines.

----The Graduate School serves as an advocate for issues and constituencies that are critical to the success of graduate programs. It provides funds and expertise to facilitate recruitment of graduate students generally, but it also pays special attention to the promotion of diversity and intellectual collegiality in each of its programs. There are special needs and issues that pertain to international students, to minority students, to women in certain disciplines, etc., that must have the particular attention and effort of the Graduate School. Finally, the Graduate School has a special role in promoting integrity in research and scholarship through courses in ethical conduct and in the example of mentors, and in developing the ability of both faculty and students to engage in mentoring relationships that will result in timely and successful completion of their degree programs.

#### **D. Graduate School Degree and Certificate Programs**

The Graduate School supervises programs leading to all Ph.D., M.A., and M.S. degrees at Duke, as well as a few more specialized Masters programs in Public Policy, Liberal Studies, and Teaching. By having a Graduate School that crosses all other boundaries at Duke, we find it easy to create, supervise, and support many truly interdisciplinary graduate programs that involve faculty from different schools at Duke. There are 49 degree-granting programs in the Graduate School, as well as more than 30 non-degree granting certificate programs that involve interdisciplinary study.

## GRADUATE SCHOOL DEPARTMENT-BASED DEGREE PROGRAMS

*(Ph.D. unless otherwise stated)*

### **Humanities:** *(A&S unless otherwise indicated)*

Art History  
 Classical Studies  
 English  
 German Studies  
 Literature  
 Music  
 Philosophy  
 Religion (A&S, Divinity)  
 Romance Studies  
 Slavic Languages & Literatures (M.A.)

### **Social Sciences:** *(A&S unless otherwise indicated)*

Business Administration (Fuqua)  
 Cultural Anthropology  
 Economics  
 History  
 Nursing (Nursing)  
 Political Science  
 Psychology  
 Public Policy Studies (M.P.P., Ph.D.)  
 Sociology

### **Biological Sciences:**

Biochemistry (Medicine)  
 Biological Anthropology & Anatomy (A&S)  
 Biology (A&S)  
 Cell Biology (Medicine)  
 Environment (Nicholas)  
 Immunology (Medicine)  
 Molecular Genetics & Microbiology (Medicine)  
 Neurobiology (Medicine)  
 Pathology (Medicine)  
 Pharmacology (Medicine)

### **Physical Sciences & Engineering:**

Biomedical Engineering (Pratt)  
 Chemistry (A&S)  
 Civil & Environmental Engineering (Pratt)  
 Computer Science (A&S)  
 Earth & Ocean Sciences (Nicholas)  
 Electrical & Computer Engineering (Pratt)  
 Mathematics (A&S)  
 Mechanical Engineering & Materials Science (Pratt)  
 Medical Physics (Medicine)  
 Physics (A&S)  
 Statistics & Decision Sciences (A&S)

## **GRADUATE SCHOOL INTERDISCIPLINARY DEGREE AND CERTIFICATE PROGRAMS**

### **Humanities:** (all A&S)

History & Philosophy of Science, Technology, & Medicine  
 Humanities (M.A.)  
 Interdisciplinary European Studies  
 Latin American & Caribbean Studies  
 Medieval & Renaissance Studies  
 Philosophy of Biology

### **Social Sciences:** (all A&S)

Advanced Quantitative Methods in the Social Sciences  
 African & African American Studies  
 Canadian Studies  
 Developmental Psychology (Joint with UNC-CH)  
 East Asian Studies (M.A.)  
 Education Policy Research  
 Information Systems and Information Sciences  
 International Development Policy (M.A.)  
 Health Policy  
 Political Economy  
 Slavic, Eurasian, & East European Studies  
 Women's Studies

### **Biological Sciences:** (All A&S and Medicine unless otherwise noted)

Cell & Molecular Biology (Admitting)  
 Cognitive Neuroscience (Admitting)  
 Computational Biology & Bioinformatics (Ph.D.)  
 Developmental Biology (Admitting)  
 Ecology (Ph.D.) (Nicholas and A&S)  
 Genetics & Genomics (Ph.D.)  
 Integrated Toxicology (Admitting) (Nicholas & A&S)  
 Molecular Cancer Biology (Ph.D.) (Medicine only)  
 Structural Biology & Biophysics (Admitting)

### **Physical Sciences & Engineering:**

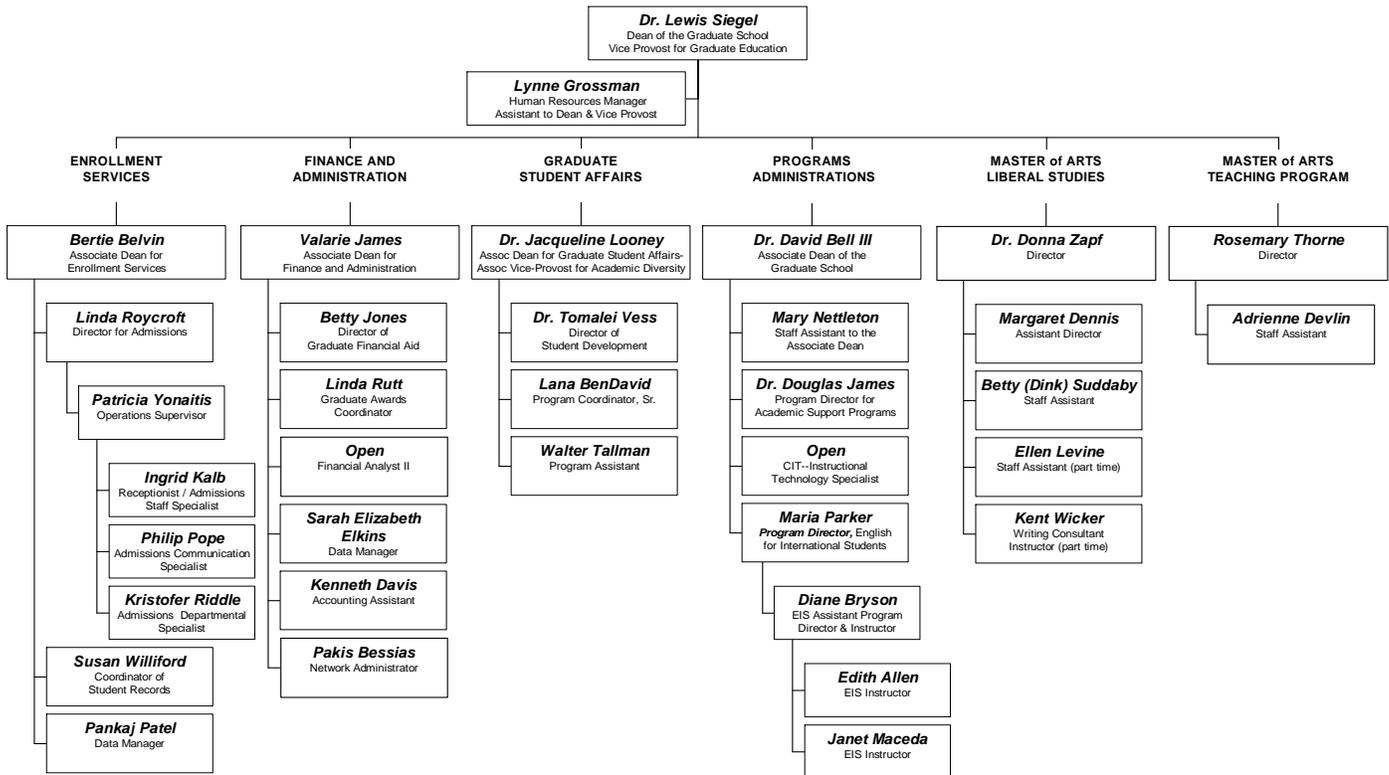
Biological & Biologically Inspired Materials (Admitting) (Pratt, A&S)  
 Biological Chemistry (Admitting) (A&S, Medicine)  
 Biomolecular & Tissue Engineering (Pratt, A&S)  
 Computational Science & Engineering (A&S, Pratt)  
 Hydrology (Nicholas, Pratt)  
 Marine Sciences (Nicholas)  
 Nanoscience (A&S, Pratt, Medicine)  
 Non-Linear & Complex Systems (A&S, Pratt)  
 Photonics (Pratt, A&S)

### **Graduate School** (not affiliated with any other School)

Liberal Studies (M.A.)  
 Master of Arts in Teaching (M.A.T.)  
 Teaching College Biology

**E. Organization of the Graduate School as an Administrative Unit**

**DUKE UNIVERSITY GRADUATE SCHOOL  
ORGANIZATIONAL CHART, JANUARY 2006**



**II. DEMOGRAPHICS**

**A. U.S. applications to Graduate Schools decline throughout the 1990's---Graduate School Enrollment Decreases**

When the last Graduate School Plan was submitted in 2000, there had been a decade-long decline in the number of U.S. citizens applying to American graduate schools, that had been only partially balanced by continual increases in international applications that had begun in the early 1980's. By the year 2000, U.S. applications to Duke had declined so much that the number of international applicants was nearly equal to the number of U.S. applicants, and substantially greater, in fact, than the number of U.S. majority applicants. There was serious concern, then, about the ability of smaller Duke graduate programs to maintain entering classes of sufficient critical mass and quality as to justify continuation by the university. There was also concern that the number of U.S. minority applicants had also dropped substantially in the latter half of the 1990's, so that Duke's ability to deliver on its commitment to diversity at the graduate level appeared to be in jeopardy.

The national decline in applications to U.S. graduate schools--particularly at the Ph.D. level and in nearly all disciplines--coincided, at Duke, with a period of downsizing of a number of Ph.D. programs (including some of our most highly ranked in the 1995 NRC report) that was needed to carry out the commitment of the Graduate School's 1994 Plan to provide competitive packages of 5 to 6 year support, with limited service requirements, to all of its Ph.D. students. As a result of these forces, the size of the graduate class that entered in 2000 was nearly 20% less than it had been a decade before, and the total enrollment of the Graduate School, which had reached 2300 in 1992, had declined to just over 2200 in the Fall of 2000.

Given the overall nearly 25% decline in applications that occurred between 1995 and 2000, and the financial pressures to reduce the size of the overall Ph.D. population in many of Duke's graduate programs, the faculty responded by reducing significantly the number of offers of admission it made in 1999 and 2000, to levels that were about 15% fewer (1300 vs. 1500) than they had been in the early 1990's. By doing this, the enhanced selectivity of Duke's Graduate School—an important measure of the overall quality of our graduate programs---which had improved from 42% in 1985, to 33% in 1990, and then to 21% in 1995, was largely maintained, although, even so, selectivity had slipped to 25% by 2000. Fortunately, the yield of Duke's graduate programs, which had averaged about 39% throughout the decades of the 1980's and 1990's, did not slip in the face of increased competition for a limited supply of high quality applicants to U.S. graduate schools, and there was only a small---and probably not statistically significant---decrease in average GRE (Verbal + Quantitative) scores from an average of 1320 throughout most of the 1990's to just under 1310 by 2000. The average undergraduate GPA was maintained at the 3.6 level. A rough indicator of the relative success of graduate programs in attracting and matriculating the students that they want in the face of competition is the ratio of Yield/ Selectivity. This ratio, which had doubled for Duke's Graduate Program between 1985 and 1995 (from 0.87 to 1.81), now slipped somewhat, to 1.57, and there was real concern that the quality of Duke's graduate programs, even with reduction in size, was in some danger.

It now seems probable that the large decline in applications seen in the 1990's from U.S. citizens to research oriented graduate schools, particularly to the very lengthy and often not financially rewarding path of seeking the Ph.D., was largely a reflection of the long economic expansion of that decade, with the resulting availability of rewarding employment opportunities for U.S. baccalaureates that demanded considerably less sacrifice in time, effort, and opportunity cost than did Ph.D. study. This is a cyclic phenomenon that has been seen previously by U.S. graduate programs. At the same time, the booming U.S. economy was a magnet for bright foreign students who could come to this country for an education that they could not receive at home, and could, in many cases, find ways to stay on in a U.S. in sore need of a highly trained workforce, particularly in areas of science and technology that were not attracting adequately prepared domestic students. It was not surprising then, that, as the economic boom became nearly a decade old, the fraction of matriculants to Ph.D.-oriented graduate schools, such as Duke's, that were international in origin was increasing dramatically.

#### ***B. Rebound in U.S. applications after 2001---Graduate School Enrollment Reaches Record***

As we now know, the dot-com bubble burst, the events of 9/11/2001 followed, and the economy became much less open and attractive to young persons with only a college-level degree. As might have been expected, domestic applications to U.S. graduate schools began to increase dramatically in 2002 and have continued to do so each year since. The number of U.S. applicants to the Graduate School at Duke increased by more than 60% (from 2600 to 4200) in the four years from 2001 to 2005. While still considerably less than in the peak year of 5000 applications

in 1992, this increase has substantially eliminated the possibility that a number of Duke's small graduate programs might have to fold due to lack of critical mass of high quality students.

The applications from U.S. minority groups---such groups are generally even more sensitive to the opportunity costs of graduate education in a good economy than the population as a whole---increased at about the same rate (60%) as the total U.S. applications to Duke from 2001 to 2005 (from 460 to 750). The applications from African-American students to Graduate School at Duke increased at an even greater rate (75%, from 150 to 260) than the U.S. minority group as a whole, and both groups of applicants reached record levels this past year.

The total number of applications to Duke's Graduate School went from its decade-long low point of 5500 in 2001 to an all-time record of 7900 just two years later, in 2003, as foreign applications continued to increase at the same rate as domestic applications in that two year period. For the years 2001, 2002, and 2003, there were actually, for the only time in its history, more international applications to Graduate School at Duke than domestic ones. This dramatic burst in all categories of applications to Duke permitted the selectivity of the Graduate School as a whole to be better than 20% (at 18%) for the first and only time in history in 2003. The yield had now improved to 44%, so that the Yield/ Selectivity ratio for 2003 reached its record of 2.44 in that year. The GRE V+Q average scores rebounded to just under 1330, although the GPA slipped a bit to 3.5.

Due to a number of factors---such as the difficulty and delays in obtaining visas in some countries as a result of procedures put into place after 9/11/2001; revised testing procedures put into place in China and Korea following evidence of cheating on the GRE exams in those countries; the unpopularity of U.S. international policy subsequent to the invasion of Iraq; as well as increased competition from expanding graduate programs in other nations---there was a large drop in foreign applications to U.S. graduate schools in 2004. The 26% drop in one year at Duke (from 4200 to 3100) was not unusual among U.S. graduate schools, and, at Duke, was almost entirely accounted for by a 50% drop in applications from China, the largest source of non-U.S. applications to our Graduate School. In spite of this, the number of U.S. applications continued to increase in 2004, and the total number of applications to Duke, although lower than in 2003, was, at just under 7100, still the second largest in Duke's history. In 2005, domestic, U.S. minority, and foreign applications continued to increase, so that the total number was now just under 7500.

Given this much larger pool of applicants, it is not surprising that the number of offers of admission began to increase once again (though not to the record levels seen in the early 1990's), even though selectivity in 2004 and 2005 has been maintained at just above the 20% level, and yields have continued to be high, at about 44%. The Yield/ Selectivity for both years was almost identical, at 2.15, just below the record in 2003. (GPA's have increased again to 3.6, and average GRE V+Q scores are again at about 1320.) These factors, taken, together, have resulted in classes entering Duke's Graduate School in each of the past two years that were larger than ever seen previously. The four-year average has been 640 (the entering class in 2005 was a record 670)---compared to an average of about 510 for the five years 1996-2000. Not surprisingly, then, the past five years have seen substantial growth (27%) in the full enrollment of the Graduate School, from 2200 students in Fall 2000, to 2800 students in Fall 2005.

The growth in the past five years has been in both Ph.D. and non-Ph.D. (almost exclusively Masters) programs of the Graduate School. The non-Ph.D. programs, which matriculated an average of about 185 students in 1996-2000, attracted an average of 215 students in 2001-2005. This number, however, is by no means exceptionally large by historic Graduate School standards

for such programs (the average for the decade of the 1980's was 225 for non-Ph.D. programs). The total enrollment of non-Ph.D. students, which was in the 500 to 660 range throughout the 1980's and early 1990's, but had dipped to about 400 in the mid- and late 1990's, has again increased to the 550 to 600 range (which has significant positive revenue consequences for the Graduate School, since several of these programs are generators of real tuition revenue for Duke.)

In contrast, while the largest matriculating class of Duke Ph.D. students prior to 2001 was 373 in 1991---and the average class for 1996-2000 was 327---every new Ph.D. class from 2001 and after has exceeded 400, with the record being 440 in 2004 and the five-year average being 420. The total Ph.D. enrollment, which remained relatively stable at about 1800 for most of the 1990's, had reached just over 2200 by 2005. In contrast to the Masters programs, which, in general generate revenue, this increase in Ph.D. students has placed a significant financial burden on the Graduate School in trying to see that competitive multi-year stipends can be offered to Ph.D. populations of this size.

### **C. Diversity Increases**

Fall 2005 saw the largest enrollments in the history of the Graduate School for the following groups: Total students, 2800; All U.S., 1900; U.S. minority, 350; African-American, 140; and International, 900. While the number of U.S. majority students, at 1540, was the largest in a decade, it was still substantially below the numbers of about 1680 seen in 1989-91 for a much smaller---and much less diverse---Graduate School total population.

Of the students enrolled in 2005, 12.6% (a record proportion) were U.S. minority; 4.9% were African-American (close to the record 5.1% in 2000); 32.3% were international (slightly down from the record 33.9% in 2003); and 55.1% were U.S. majority (slightly up from the record low of 54.2% in 2003). The Graduate School clearly has the most broadly diverse population of students of any School at Duke.

### **D. Graduate School enrollment shifts away from Arts and Sciences toward sciences and engineering in other Schools and interdisciplinary programs**

Of the 2220 Ph.D. students enrolled in 2005, just over 1235 (56%) were in Arts & Sciences graduate programs, and slightly fewer than 985 in all the other Schools.

All of the A&S divisions units have grown since 2000, when the Humanities and Social Sciences were at about their lowest numbers following the downsizing program of the mid-1990's: Social Sciences, grew from about 370 to 390 (6%); Humanities from about 360 to 380 (6%); and Natural Sciences, from about 425 to 455 (8%).

The largest growth, however, has occurred in other areas: Medicine, from 310 to 455 (47%); Engineering, from 220 to 335 (50%); Business, from 50 to 85 (63%); and Environment, from 80 to 115 (44%). Taken together, these differential growth rates have continued the intellectual shift within the Graduate School away from A&S toward the other schools, and, perhaps more importantly, away from the Humanities and Social Science disciplines toward the sciences and engineering fields.

One of the most striking features of the past five years has been the growth of Ph.D. enrollments in non-departmental *interdisciplinary graduate programs*, particularly in the biological sciences. If one aggregates all of the Biological Science departments and programs in the Graduate School, the total growth between 2000 and 2005 was from 415 to 455 in the various departments (10%).

However, students enrolled in interdisciplinary programs as opposed to departments grew from 95 to 230 (an increase of 140%). That is, 135 of the 175 incremental students, or 77%, in this rapidly growing area, were associated with non-departmental graduate programs.

With respect to individual Ph.D. programs, the largest growth in student enrollment between 2000 and 2005 was seen in: Biomedical Engineering (+62, from 79 to 141); Psychology (+38, from 55 to 92); Electrical & Computer Engineering (+28, from 81 to 109); and the interdisciplinary Ph.D. degree-granting programs Genetics & Genomics (+36, from 35 to 71), Ecology (+34, from 8 to 42), Computational Biology & Bioinformatics (+20, having just been started in 2003), and Molecular Cancer Biology (+19, from 33 to 52).

More modest, but still substantial, growth was seen in Mechanical Engineering (+14, from 38 to 52); Art History (+12, from 16 to 28); Statistics (+12, from 21 to 33); Immunology (+12, from 24 to 36); Biochemistry (+11, from 56 to 67); and Physics (+11, from 65 to 76).

Only a few departments experienced significant declines in Ph.D. enrollment in the five year period. For the one with the greatest apparent decrease, Biology (-28, from 105 to 77), this represents little more than an accounting issue, i.e., an enrollment shift of some students still working for their degrees with Biology department faculty from the formal "Biology" Ph.D. program to one of the interdisciplinary Ph.D.-granting programs in the biological sciences. History did experience a significant, but planned, decrease in enrollment (-16, from 82 to 66), as the department, under new leadership, sought to reduce the large number of students past the 7<sup>th</sup> year still enrolled in the program, largely through encouraging the "stragglers" to finish their dissertations. Economics (-11, from 78 to 67), underwent what is expected to be a temporary reduction in its graduate program as it improved the support offered to its Ph.D. students and devised the EcoTeach program, which reduced the teaching demands on the graduate students to some degree. Biological Anthropology & Anatomy (-7, from 21 to 14), underwent a reduction in student population to a new steady state reflective of its faculty size and financial allocation following its recent transfer from joint administration by Medicine and A&S to the latter School alone. The size of this program is expected to increase modestly again in the near future. Admission into the very small Ph.D. program in Slavics (-5, from 6 to 1) was suspended due to a paucity of faculty resources to support the program as it had been constituted.

In the cases cited above, both growth and contraction were accomplished smoothly and without disrupting the ability of the program to manage its financial commitments to its students. In a few cases, departments have simply matriculated more students in the past few years than their Graduate Awards budgets would permit them to support in the next year or two without running a deficit. These departments: Chemistry (increase of +8, from 96 to 104), Romance Studies (+8, from 49 to 57), Religion (+8, from 78 to 86), Political Science (+7, from 79 to 86), Cultural Anthropology (+4, from 30 to 34), English (+4, from 68 to 72), and Math (+4, from 39 to 43) have been authorized by the Graduate School to take in smaller classes than normal for 2006 in order to restore the graduate populations in these programs to levels that can be financially supported in the longer term.

### III. PROGRAM QUALITY

#### A. Criteria for measuring quality of Duke's graduate programs

It is, of course, the primary goal of the Graduate School to develop graduate programs of the highest possible quality. But what do we really mean by quality, and how can we measure it? In the section below, we attempt to place Duke's graduate programs (with the exception of the Masters of Public Policy, all are Ph.D. programs) in terms of several different parameters:

**Reputation** – the only basis we have for this is the set of national rankings published at periodic intervals by the National Research Council (NRC) and U.S. News and World Report (USN). In rare cases, there are credible rankings by peer faculty in specific disciplines, such as the Leiter “Philosophical Gourmet” Report in Philosophy. We also have the general comments available to us as a result of the process of external review of Duke departments coordinated through the Graduate School. Taken together, and examined over time, we can attempt, at least, to place the reputation of most Duke graduate programs within their own disciplines, compare trajectories of reputational ranking over time, and also get some sense of how Duke programs compare to one another within the broad disciplinary categories of Humanities, Social Sciences, Biological Sciences, and Physical Sciences & Engineering that comprise the Graduate School at Duke.

**Student quality** – there are several criteria by which the relative quality of the students in Duke's graduate programs (in this case all are Ph.D. programs) can be measured.

**Input criteria** -- One set of criteria can be defined as “input” measures – they attempt to measure parameters related to the admission and matriculation of new students. Such measures traditionally include

- ***Selectivity***---i.e., what fraction of applicants to the program need to be admitted to fill a class?
- ***Yield***---i.e., what fraction of admitted students actually matriculate?
- ***Yield/ Selectivity Ratio*** --- this combines the two basic admission statistics into a single one.
- ***Graduate Record Examination scores***
- ***Undergraduate Grade Point Average***
- ***Competitive Fellowships***---The Graduate School traditionally gives great weight in making budget allocations to departments and programs to a measure internal to Duke and generally applicable to all disciplines---the fraction of each entering class of students that are able to win merit-based competitive fellowships awarded by the Graduate School. Such fellowships include: James B. Duke, Duke Endowment, University Scholars, Stern, Frankel, and Advanced International Dissertation fellowships, and Bass and Named Instructorships.

An additional measure could be an estimate of the quality of the undergraduate institutions from which each program attracts its students, but this data is not readily available at this time

**Output criteria: Academic Placements**--- Although we would like to be able to measure the actual scholarly output of our graduate students, both while in Graduate School at Duke, and in their subsequent careers, we have no ready means to do this. We do have reasonably good data, however, on the types of academic positions that our Ph.D.s obtain, and, although this is by no means a statement that it is an obligation on the part of Duke Ph.D.s to seek tenure

track faculty positions, it is clearly one of the goals of our faculty to place at least some of the graduates of their doctoral programs in research and doctoral universities, and, it is certainly considered a mark of pride if Duke doctoral programs are able to place graduates in what are considered to be top-ranked departments (which we define as in the top 25 departments in a given discipline as reported in the NRC rankings of doctoral programs published in 1995).

## **B. Reputational Rankings**

### **Humanities**

**Literature:** Duke's unusual Program in Literature was ranked #2 in the nation in the 1995 NRC Report. The latest (2005) USN rankings do not specifically rank any Humanities graduate programs other than English, but with respect to the latter department, the subfield of Literary Criticism and Theory at Duke is ranked #1. The most recent external review report of Duke's Literature program agreed that it was certainly one of the best, if not the best, program of its type in the nation. It might be noted that the 1982 NRC rankings placed Duke #18 for doctoral training in Literature. The rise in reputation reflects the dramatic change in emphasis and investment in faculty made by Duke in this area in the mid 1980's.

**English:** This department was ranked #27 by the NRC in 1982, and, due to the investments in faculty in the mid to late 1980's, the ranking rose sharply to #7 in the 1993 USN and #5 in the 1995 NRC reports. The department suffered an exodus of faculty in the 1990's, and was, in effect, put into a type of receivership upon the advice of an external review panel. With the advent of Maureen Quilligan as a new external chair, hiring of new faculty, and a great deal of attention, this department has risen close to the top 10 again, being placed at #12 in the 2005 USN rankings. These rankings place Duke's English department well in the top group in a number of subfields: As already mentioned, Literary Criticism and Theory is ranked #1, Gender and Literature #2, African-American Literature #3, American Literature after 1865 #3, and before 1865 #8. In addition, Medieval and Renaissance Literature was rated #14, and 18<sup>th</sup> through 20<sup>th</sup> Century British Literature #16.

**Philosophy:** Duke's Philosophy department was ranked at below the top 50 and at #44 in the 1982 and 1995 NRC reports. The department has over the past decade hired several new faculty, who joined with Duke faculty in other departments to create particular intellectual strength in the philosophy of various fields related to natural and social science, ethics, and political philosophy. The most recent (2004) report by the well regarded Leiter "Philosophical Gourmet" placed Duke's department at #29. Within its areas of particular specialization, Duke's Philosophy Ph.D. program was tied for #1 in Philosophy of Social Science and #2 in Philosophy of Biology. The Leiter rankings place departments in broad bands, but in terms of absolute peer quality scores, Duke was tied for #2 in Applied Ethics, #12 in Political Philosophy, #13 in Philosophy of Cognitive Science, #18 in Philosophy of Science, and #19 in 18<sup>th</sup> Century Philosophy. This department, by focusing on a few particular areas of strength, is clearly on a strongly positive trajectory. The intellectual specializations of the current Philosophy faculty make for research and teaching linkages not only to the Humanities (e.g., classics, religion), but also to the Natural (e.g., biology, neuroscience) and Social (e.g., political science, economics, psychology) Sciences. The artificial divisional structures of Arts & Sciences (and even of the Graduate School) might be necessary from an administrative perspective, but Philosophy holds that such structures should not result in boundaries that in any way constrain activity when it comes to pursuing scholarship at the frontiers of knowledge

**Religion:** The Duke Graduate Program in Religion is a truly interdisciplinary unit that is a cooperative activity of faculty in both the A&S Department of Religion and the Divinity School. The Duke program was ranked #4 in the 1995 NRC, and external reviews give us no reason to believe that its standing has changed very much since that time. Given the large size and the diversity of specializations of its faculty, the Religion Ph.D. program has operated with a large number of “tracks”, such that it has often been difficult to support enough students to meet this variety of faculty interests, and this tendency toward balkanization and its resulting tensions has been noted by several external review teams as a serious problem. All reviews have noted the very high quality of faculty from both the Religion department and the Divinity School, so there is reason to believe that, in spite of its conflicts, the national standing of the Ph.D. program remains high.

**Romance Studies:** There have been no rankings of Duke’s doctoral program in Romance Studies since the 1995 NRC report, in which French was ranked #3 and Spanish #2. As with Literature and English, these rankings represented a quantum leap from the 1982 NRC rankings of French at #16 and Spanish at #21, reflecting the major faculty investments in the literature-oriented Humanities in the mid- to late 1980’s. Although external reviews of Romance Studies continue to indicate that both the French and Spanish divisions, which function somewhat autonomously with respect to doctoral training, are still very highly regarded, the considerable turnover in both areas in the past decade makes their current exact standing uncertain.

**Classical Studies:** Classical Studies is nationally the discipline ranked by the NRC that turns out the fewest Ph.D.s annually---75, as compared, for example, to 100 in German and 373 in the Romance Studies languages. In 1995, there were only 29 Ph.D. programs in the rankings of Classical Studies by the NRC; of these, Duke’s department ranked 15<sup>th</sup>, about the same as it had been in 1982 (16<sup>th</sup>). Recent external reviews suggest that Duke has several areas of particular strength but, overall, there is no indication that its position is very different than it was in the previous rankings.

**Music:** Music was ranked #22 in the 1995 NRC report. It has strengths both in composition and musicology. Given the relatively small size of Duke’s department and the absence of a conservatory function, it is not likely that Duke’s department can move very much higher in the rankings unless it finds a particular subfield in which it can truly stand out. The recent and possible future investments in the area of ethnomusicology may serve this purpose, and use to best advantage Duke’s strength in the literature-based humanities and in Cultural Anthropology to bring students of high quality with interests in this interdisciplinary area to the Music Ph.D. program.

**Art History:** The Duke Ph.D. program in Art History, started in 1991, was not ranked in the 1995 NRC report. The department is small, but external review teams have expressed high regard for the scholarship of its faculty, often expressing surprise that the department is not more widely known. This department is widely regarded as a “comer”; it is entirely possible that it is even now at, or close to, the Top 10 level.

**German Studies:** The Duke doctoral program in German Studies, begun in 1991 and not ranked in the 1995 NRC report, is the smallest one by far in the Humanities. It has a tenure track faculty of only 5, and generally takes in only an average of 2 to 3 students per year. It is an unusual program in that it embraces the interests of a number of faculty not actually in the German Languages and Literatures department in a broad-based interdisciplinary approach to German Studies. Given this novel approach, it is difficult to place the program in a ranking of German

doctoral programs that are both larger and more traditional. The German department at UNC-Chapel Hill is just such a program. To its credit and that of the Duke department, the two units have recognized that the complementarities between their approaches and strengths, if combined, might well produce one of the very best Ph.D. programs in the nation. The two departments have made significant progress toward creation of just such a joint program---such a combination could serve as a model for other small graduate programs at the two universities in the future.

### **Social Sciences**

**Political Science:** Duke's Political Science doctoral program has been on a strongly positive directory for the past two decades. Ranked #21 in the 1982 NRC, #13 in 1993 by USN and #14 in 1995 by NRC, the ranking has jumped to #8 in the 2005 USN ranking, making Political Science the most highly peer-regarded Duke department in the Social Sciences. The department has developed and hired faculty of unquestionably high stature in the past decade; but it has also had a substantial number of departures of such faculty (Robert Bates and Robert Keohane are but two examples). Nevertheless, the latest USN rankings of Political Science subfields indicate that the Duke department has established and held onto reputations for excellence in all of the major subfields in the discipline: Political theory #6, International Politics #7, Comparative Politics #10, American Politics #10, and Political Methodology #13.

**Sociology:** The Sociology doctoral program has made significant progress in the past decade, rising in the rankings from #21 in the 1982 NRC, to #19 and #20 in the 1993 USN and 1995 NRC, respectively, to #14 in the 2005 USN Rankings. The rise in reputation reflects a number of faculty hires in the past few years that have significantly added strength to an already well-regarded department. It is entirely possible that this department will be in the Top 10 in the upcoming NRC assessment of doctoral programs. USN considers Duke's principal strength to be in Social Psychology (at #7), but there is high regard for the subfields of Economic Sociology (#12), Social Stratification (#14), and the Sociology of Population (#15), as well.

**History:** Duke's History doctoral program was ranked #21 in 1982 by NRC, and rose to #14 in 1993 (USN) and #15 in 1995 (NRC) as a result of a concentration of faculty hiring in fairly focused areas, many of which were centered on relatively recent periods in U.S. history. In spite of significant transitions in its faculty, the department maintained its #15 ranking in the 2005 USN report. An external review of the History program in 2000 was highly critical and called for the hiring of an external chair who would bring the disparate groups of faculty together, strengthen a graduate curriculum that had significant gaps, and lead the faculty to make priority decisions as to the directions it would take in the future. The department undertook the recommended reforms immediately and in 2004, Sarah Deutsch, a noted scholar in Women's History, joined the department as chair. The department participated energetically in the national Carnegie Initiative on the Doctorate program and totally revised its graduate program structure and offerings. It has been suggested by external reviewers as well as current faculty that the Duke History department might need to broaden its scope beyond the more recent periods as well as its geographical perspectives in order to advance very much higher in the rankings. The 2005 USN report indicated that the Duke History department has real strength in African-American History (#6), Latin American History (#9), Women's History (#11), as well as Modern American History (#18) and U.S. Colonial History (#19).

**Economics:** The reputation of Duke's Economics department has not changed in spite of substantial alterations in its faculty at various periods in the past two decades. Ranked #21 by NRC in 1962, the department was ranked #21 and #22 by USN in 1993 and NRC in 1995, respectively, and remained at #21 in the 2005 USN report. The only highly ranked subfield is

Econometrics (at #12). After a significant wave of departures of a number of distinguished faculty in the late 1990's, which left a substantial deficit of faculty in the "mid-age" range of 45 to 55, and an external review that pointed out the fragility of the program, the department was authorized to make a substantial number of hires under a new chair, Thomas Nechyba. The graduate program was reorganized, new resources were put in place to try to reduce a high rate of attrition (that is characteristic of the discipline nationally). In both its choice of new faculty and its graduate training, the department has emphasized a new approach which fosters strong interactions across the traditional fields of macroeconomics, microeconomics, and econometrics, as well as between the multiple subfields of microeconomics, in approaching given problems of research interest. This approach is unusual in a discipline which almost everywhere defines itself in terms of rigid subfields. These changes and the energy they reflect give cause for optimism that the trajectory of the Economics program will be much more positive in the near future.

**Psychology:** Like Economics, Duke's Psychology Ph.D. program, taken as a whole, has remained remarkably stable in its reputation in spite of major changes in direction resulting from the decision to split the Psychology department itself into two distinct units. Ranked #28 in the 1982 NRC report, the Ph.D. program retained its #28 place in the 1993 USN ranking, slipped to #33 in the 1995 NRC report (we do not consider this difference, at this ranking level, to be significant), and was ranked #28 again in the 2005 USN study. The only highly ranked subfield in this discipline at Duke is the Clinical Psychology Ph.D. program (#11). The 1990's saw a major Duke initiative in the area of cognitive neuroscience, with the majority of faculty hires in this initiative going into the department of Psychological and Brain Sciences. During the same period, the other Psychology department, termed Social and Health Sciences, maintained its strength, in cooperation with Medical Psychology faculty in the School of Medicine, in the graduate program in Clinical Psychology, and in developmental psychology. The latter field was greatly strengthened by creation of a Duke-UNC Cooperative Program in Developmental Psychology, which brought together faculty in this subfield from both Duke departments with one of the top ranked faculties in the nation in this area, at UNC-Chapel Hill. In the past few years, as a result of an external review of Psychology: SHS, Duke began a major faculty hiring initiative in Social Psychology, and the Graduate School provided funds for an initiative which would bring together strong faculty in this field from A&S with a distinguished group of faculty working in this field in Fuqua. The two Psychology departments will be re-joined in the near future; it should be recognized that, at the graduate level, the Graduate School has always formally maintained a single Ph.D. in Psychology.

**Cultural Anthropology:** The Duke Ph.D. program in Anthropology was ranked #24 in 1982 by NRC. It was split into two departments, Cultural Anthropology and Biological Anthropology and Anatomy, in 1988. The list of faculty submitted by Duke for the 1995 NRC ranking included both departments, and the resulting combined group was ranked #18. There are no more recent rankings. However, beginning in the late 1990's, there has been development, largely through the hiring of faculty at junior rank, of a Cultural Anthropology department that now strongly bridges the Humanities and Social Sciences, and in the most recent external review, was considered to be one of the very best departments in its areas of concentration in the nation. We do not know how this department, which represents only one portion of a broad discipline, which usually includes physical or biological anthropology in a single unit, will actually be formally ranked in the future. However, given the high selectivity and yield of its graduate program, the quality of its graduate students as measured by their ability to compete for merit fellowships, and its record of placing its graduates in top research universities, as described below, it is probable that this ranking could well be at or near Top 10.

**Business Administration:** From the standpoint of Ph.D. placement, the Ph.D. program in Business Administration is by far the most successful at Duke. In part, this reflects the high demand for top quality faculty at U.S. Business Schools. It also represents the high regard in which the Duke program is held by its peers. The latest USN rankings of Business Schools puts Duke's Fuqua School #9 in terms of peer assessment of faculty quality. (This is not the only factor used to establish the overall ranking of Fuqua as a Business School.) Duke's faculty in the area of Marketing (many of whom are participating in the new university-wide initiative in Social Psychology) is one of the most highly regarded in the nation, ranked #5 by USN. The faculty in Management, at #10, and Finance, at #13, are also a source of strength. Dean Breeden has put great emphasis (and resources) on expanding and strengthening the Ph.D. program in Business and the research activities of the Fuqua faculty, with particular emphasis on increasing faculty strength in Finance, in Business Economics, and in Management.

**Public Policy:** Duke does not yet have a Ph.D. program in Public Policy, but it does have a highly regarded Masters of Public Policy graduate program within the Graduate School. Ranked together with professionally oriented Masters programs in Public Affairs at other universities, Duke's is #10 in the latest USN report. The high reputation of Duke's M.P.P. program in a large number of subfields bodes favorably for the future of the new Ph.D. program in Public Policy scheduled to begin matriculating students for Fall 2007. Thus, clearly taken together with a subset of the Nicholas School faculty in the Ph.D. program in Environment, Duke is ranked #2 in Environmental Policy and Management. The Public Policy faculty's declared major interest, Public Policy Analysis, is ranked #5; and more specialized subfields, such as Health Policy and Management (#9), Social Policy (#11), Public Finance and Budgeting (#12), and Public Management and Administration (#12) are also highly regarded by peers.

### **Biological Sciences**

**Biology:** The Ph.D. in Biology (formerly divided into Botany and Zoology) has not been explicitly ranked as such because the taxonomy used by NRC and USN does not coincide with the faculty comprising this department as structured at Duke. In 1982, Duke's Botany and Zoology departments were ranked #6 and #7, respectively by the NRC. In 1993, USN ranked Biological Sciences at Duke (which includes all of the biomedical disciplines as well) #16, a ranking which improved to #12 in the most recent USN report on the sciences in 2002. The 1995 NRC report ranked the categories "Ecology, Evolution, and Behavior" #3; however this category included only a fraction of the faculty in Botany and Zoology at that time, and also included a substantial number of faculty from the Ph.D. programs in Environment and Biological Anthropology and Anatomy. The important Developmental, Cell, and Molecular Biology faculty of what is now the Duke Biology department were included, together with a much larger group of Medicine faculty, in NRC categories which were ranked #14 in 1995.

The Duke Biology department has undergone significant change since 1995. On the recommendation of a strong external review report, the faculties of Botany and Zoology were combined to form a single large Biology department in Arts & Sciences. The intellectual division in the new department is, if anything, along the lines of the 1995 NRC taxonomy: Ecology/ Evolution/ Organismal Biology, and Developmental/ Cell/ Molecular Biology. A number of recent faculty hires, including a strong new external chair, have tended to bridge this intellectual divide, through an emphasis on Evolution and Development, and the growing use of genomic approaches in all subfields of Biology.

In addition, the emergence of Ph.D.-granting interdisciplinary programs such as Ecology and Genetics & Genomics, has meant that a substantial number of Ph.D. students working with faculty situated in the Biology department are actually working toward degrees that are not named “Biology”. The increased number and/or size of interdisciplinary graduate programs in the biological sciences at Duke which have the authority to admit new students, but not award the Ph.D. by themselves, has meant that as many as 50% of the Ph.D. students working on dissertations supervised by Biology faculty were not admitted to Duke directly through the Biology department. Given the new emphasis on genomics at Duke and the creation of the IGSP, there is every reason to believe that Duke’s doctoral programs in biology (i.e., the Biological Sciences as a whole) will maintain their national stature, and possibly even enhance it, even if the taxonomy chosen to represent this broad area in the U.S. does not coincide precisely with our departmental and programmatic designations at Duke (or anywhere else for that matter).

With respect to the reputational ranking of the Duke Biology department faculty, a recent external review, conducted after the new Biology department had been in existence only for a few years, was effusive in its praise for the scholarly activities of the Biology faculty at Duke, and certainly considered the department to be one of the best in the nation (in a very large field).

**Biological Anthropology and Anatomy:** This department was formed from the departments of Anthropology and Anatomy in 1988, and has never been ranked as such. Its faculty were included in lists submitted for the 1995 NRC report in both the Anthropology and Ecology, Evolution, & Behavior categories. The department, though small, is generally regarded as one of the best biological anthropology faculties in the nation.

**Ecology:** The interdisciplinary Ph.D. program in Ecology was created in 2000 and includes faculty from Environment, Biology, and BAA. A substantial majority of its doctoral students now work with Nicholas School faculty, with a significant orientation toward conservation biology. There is no national ranking of Ecology as a discipline itself, although, as previously stated, the 1995 NRC report ranked the field “Ecology, Evolution, and Behavior” as #3 in the nation. There is no question that Duke’s faculty in the broad field of Ecology is one of the best in the U.S., as evidenced by the fact that the total number of applications for admission to the Ecology Ph.D. program has exceeded the number of applications to the highly regarded Biology department itself in the past several years.

**Biomedical Sciences:** The structure leading to the Ph.D. in the biological sciences at Duke is highly fragmented. There are a total of 18 distinct departments and programs (including, possibly arbitrarily, Environment)---many of which represent highly overlapping sub-disciplines---that have the ability to admit students for Ph.D. study, and 13 of these have the authority to independently award the Ph.D. This situation makes any congruency between Duke’s taxonomy in the biological sciences and that of any national ranking agency, such as NRC or U.S. News, almost coincidental. Each of the national categories include faculty at Duke who belong to more than one of these 13 degree-granting programs. Nevertheless, we can say the following:

- Duke’s doctoral programs in the field of **Biochemistry** have remained relatively stable in national reputation for the past two decades: ranked #13 and #15 by NRC in 1982 and 1995, respectively, this subfield of Biological Sciences was ranked #12 in the most recent U.S. News report. At Duke, Ph.D. training in this broad area includes students admitted through the Department of Biochemistry and the University Programs in Cell & Molecular Biology; Structural Biology and Biophysics; and Biological Chemistry, although only the department itself has the authority to award the Ph.D.

- Duke Ph.D. programs in the broad fields of **Developmental, Cell and Molecular Biology** have also remained relatively stable, with the generally trajectory being one of improvement: ranked #16 and #14 by NRC in 1982 and 1995, respectively, the subfield of Cell Biology was ranked #12 in the 2002 USN survey. At Duke, Ph.D. training in this broad area includes students obtaining degrees through the Departments of Cell Biology, Biology, and most of the other biomedical science departments, as well as students admitted through the University Programs in Molecular Cancer Biology; Developmental Biology; and Cell and Molecular Biology. All of these units, with the exception of the last two, have the authority to award the Ph.D. degree in this broadly defined area.
- Although we have no data more recent than the 1995 NRC rankings, Duke's doctoral programs in the broad area of **Genetics** were ranked #15 in that report. Since that time, there has been considerable reorganization of doctoral programs in this area at Duke, with the current offerings spread among the University Program in Genetics and Genomics, the Department of Molecular Genetics and Microbiology, and the recently created University Program in Computational Biology and Bioinformatics. Each of these degree-awarding units has a significant relationship to the investments Duke has made in the past several years in genomics through the IGSP, and it is probable that Duke will, at the least, maintain its national reputation in this highly competitive field.
- Duke's Ph.D. program in **Pharmacology** was ranked #5 in the U.S. in the 1995 NRC report. In the subsequent decade, the Pharmacology department has come to incorporate the field of Cancer Biology as well as its more traditional areas, and was recognized as very strong in what was regarded as a rather narrowly focused set of approaches to cell growth regulation by a recent external review report. Duke also has a separate interdisciplinary Ph.D. program in Molecular Cancer Biology, and it remains to be seen whether this broad area---though clearly highly regarded for the scholarly activities of its faculty---will retain its previous top 5 reputational ranking in the future, though there is little doubt that it remain Top 10 in stature.
- Doctoral education in the broad field of **Neuroscience** at Duke is associated with Ph.D.s granted in Neurobiology and Psychology (through the Psychological and Brain Sciences faculty) and the admitting program in Cognitive Neuroscience (whose students can also, in principle, obtain degrees in fields such as Philosophy, Computer Science, and Biomedical Engineering). The 1995 NRC report ranked this field #16, even though the Neurobiology department itself had been created only in 1988. The most recent USN report ranked Duke Neuroscience #10, reflecting the great deal of attention and investment Duke has given to this area in the past decade. This is a highly competitive field, and there are current efforts to integrate more closely our doctoral offerings in the broad area of Neuroscience that bode well for continuance of the positive trajectory of this field at Duke.
- There is no national ranking of Duke Ph.D. training in the departments of Immunology and Pathology. Duke Ph.D. programs have recently been created in the fields of Molecular Biophysics and in Nursing, and these are, of course, far too new to be ranked.

**Environment:** The Ph.D. degree in the broad interdisciplinary area termed Environment at Duke is categorized within the Biological Sciences only as a matter of traditional classification within the Graduate School. This classification has been rendered even more problematic by the introduction of the Ph.D. program in Ecology, which has attracted many of the biologically-oriented students working with Nicholas School faculty. The Environment Ph.D. has strength in

Environmental Economics and Policy, a Social Science subfield ranked #2 in the nation (see Public Policy), as well as in more biological and physical science-oriented approaches to environmental issues. There are few Ph.D. granting programs in the nation organized this way, and, up to now, there has been no national ranking available. The admitting University Program in Integrated Toxicology is associated with faculty in both the Nicholas School and in Medicine, and its emphasis on ecotoxicology is unusual among national programs in the broad area of toxicology. Students entering through this program usually obtain their Ph.D. degrees either through Environment or Pharmacology, and there is no national ranking for Toxicology per se.

### **Physical Sciences and Engineering**

**Biomedical Engineering:** This Ph.D. program has, since its inception, been ranked as one of the very best in its field in the nation. Ranked #6 in 1982 by NRC, #2 in 1993 by USN, #4 in 1995 by NRC, it was placed at #4 again by the 2005 USN report. The ability of this program, possibly the fastest growing in terms of graduate student population at Duke in the past five years, to maintain its high ranking in the face of a proliferation of Ph.D. programs in this field (and Bioengineering more broadly) in the nation is a tremendous achievement.

**Computer Science:** The Duke Computer Science doctoral program is on a positive trajectory and is currently the most highly ranked of the Physical Science departments at Duke. Ranked #28 in both the 1982 and 1995 NRC reports (and #25 in 1993 by U.S. News), the department has improved to #20 in the 2002 USN ranking. The Duke Ph.D. program is most highly regarded nationally in the subfield of Theoretical Computer Science (#16).

**Electrical and Computer Engineering:** This department is on the steepest positive trajectory in reputational ranking of any Ph.D. program at Duke. Ranked #54 in 1995 by NRC, it has had an infusion of distinguished faculty, programs, and facilities in the past decade, under the leadership of Dean Kristina Johnson of the Pratt School, and it moved to #23 and #29 in its two component fields in the most recent USN rankings. This is remarkable, since, even with its growth, Duke's ECE department is small compared to most of its peers (there are many such departments in public universities that have more faculty than the entire School of Engineering at Duke). With the opening of the Fitzpatrick Center (CIEMAS) and the development of new programs such as the graduate program in Photonics, it seems probable that this department can only further improve in visibility in the near future.

**Mathematics:** This department is also on a positive trajectory. Ranked #50 in 1982 by NRC, #30 in 1993 by USN, #34 in the 1995 NRC, it was ranked as #25 and #27 in its Mathematics and Applied Mathematics subfields, respectively, in the most recent U.S. News report. The sharp jump in the 1980's represented a major faculty hiring initiative, and the subsequent steady improvement reflects strategic additions since that time. The Ph.D. program was substantially revised as part of the NIH VIGRE training grant program and the participation of this department in the Carnegie Initiative on the Doctorate.

**Mechanical Engineering and Materials Science:** This doctoral program is also on a positive trajectory. The Duke Ph.D. program combines faculty in two distinct fields of Engineering in an arrangement not normally found at other universities (unlike Electrical and Computer Engineering, two distinct fields which are not infrequently combined into one department). When put together, these fields graduate more Ph.D.s nationally than any other Engineering field represented at Duke. In this context, both faculty components of the Duke department are extremely small in comparison to other Engineering Ph.D. programs in the U.S. Mechanical Engineering at Duke, ranked below #50 in the 1982 NRC report, and #42 in the 1995 NRC, has

moved to #30 in the 2005 USN report. (Materials Science, ranked #53 in the 1995 NRC, was not ranked as a field in the latest USN data.) Given the large investment Duke has made (and intends to make in the future) in the area of materials science, as exemplified by CIEMAS and the recently created Ph.D. admitting interdisciplinary program in Biologically Inspired Materials and Material Science, it can be expected that this area, in spite of its small size if only the faculty in the MEMS department were counted (which will not be the case in any faculty listings provided in the future), will become more highly visible nationally the next time this area is ranked.

**Civil and Environmental Engineering:** CEE is the smallest of the four Engineering departments in terms of faculty, research funding, and graduate program. The department has been ranked rather consistently at #35 and #27 in 1982 and 1995 by NRC, and at #34 in the 2005 USN report. A new chair was brought in to lead the department in the past five years, with the emphasis clearly being on the side of Environmental Engineering. A recent external review report commented on the excellence of several CEE faculty, but noted that the department still had a long way to go. The Ph.D. program, which had the highest rate of attrition at Duke University for the 1995-1999 entering student cohorts, was reduced sharply in size until it could be reorganized and new faculty recruited, events which took place in the past few years. With recruitment of new faculty in key areas under way, we can have some cause for optimism that the reputation of this graduate program will improve.

**Earth and Ocean Sciences:** The Duke Ph.D. program in Earth and Ocean Sciences is associated with the division of the same name in the Nicholas School. It was ranked below #50 in 1982 and at #43 in the 1995 NRC reports. The most recent USN rankings (in 1999) comprise only 27 Ph.D. programs in the field of Geosciences, and Duke's program was not among them. Given its small size and the difficulty of its transition from A&S to the Nicholas School, the program remains one of Duke's least visible in the sciences.

**Physics:** Physics and Chemistry are the only areas in which there was any substantial difference in rankings provided in comparable periods by USN and NRC. Ranked #39 in the 1982 NRC report, the Duke Physics department was ranked #27 in 1993 by USN and #42 in 1995 by the NRC. We have no ready explanation for this discrepancy. Although represented in a broad number of fields, Duke has maintained a somewhat disproportionate representation in the fields of nuclear physics and free electron laser spectroscopy, both of which, while clearly important, are not generally in high favor in other Physics departments nationally. In the 2002 USN report, Duke Physics was ranked #32. Since the average of the disparate USN and NRC rankings in 1993-95 is #34.5, it is not clear that this represents much of a change from previous rankings.

**Chemistry:** Chemistry, traditionally one of the largest of the Duke A&S-based natural science Ph.D. programs, is probably also its weakest, as determined by the national rankings. Its overall position has not changed very much in more than two decades, in spite of major attention and significant investment by the university in this department. Ranked #48 and #44 in 1982 and 1995, respectively, by NRC, the 2002 USN rankings put Duke Chemistry at #43 (which is, if anything, a decline from the anomalous ranking of #32 given in 1993 by USN, or from the average of the 1993-95 NRC and USN rankings, #37.5). A few strong faculty were recruited to Duke in the past decade, and a number left the university. The report of an external review team in 2000 emphasized the need for much improved facilities for Chemistry at Duke if the university were going to try to make major recruitments in this area, and Duke has responded, in part for this reason, with construction of the French Science Building (which also provides new and more modern facilities for many faculty in Biology). Chemistry is, indeed, such an important discipline at any research university, that it clearly cannot be permitted to remain in its current position of national visibility. Recent and anticipated Duke faculty recruitment, particularly in

association with the broad initiatives in Imaging, Materials Science, and Chemical Biology, should improve the situation significantly.

**Statistics and Decision Sciences:** This Ph.D. program was too new to be ranked by the NRC in 1995 and has not been formally ranked since. The Duke program, led by the faculty in the Institute for Statistics and Decision Sciences, has focused heavily (but not exclusively) on a Bayesian approach to statistics, and has developed close ties with the biomedical community. There have been two external reviews of the program since its inception, and both have commented enthusiastically on the scholarly accomplishments of the ISDS faculty and the strength of the graduate program. This department, in the next rankings, could well be at or near the Top 10 level.

### **Summary**

Rankings of doctoral programs in terms of faculty reputation are subjective at best. They are subject to tremendous “halo” effects, in that the name of a distinguished university tends to lift the ranking of all of its component programs. There is a lag in the recognition by many peers that there has been a significant turnover in the faculty in a given program, with a consequent tendency for rankings to change slowly over time unless a program has achieved very high visibility through concentration on a highly visible frontier area of the discipline. Perhaps most important, reputational ranking scores depend largely upon recognition by peers of the names of the faculty listed by an institution as constituting the group associated with a particular Ph.D. program. This means that larger programs--if for no other reason than, with a larger number of faculty names, it is more likely that at least some will be recognized by a given peer--tend to be ranked more highly than smaller ones. (Obviously, this is not always the case, particularly if the faculty, as in the example of Caltech, has a disproportionate number of Nobel Prize winners.

Also, there are legitimate reasons to rank a doctoral program more highly if it gives the opportunity for its students to obtain a broader knowledge and perspective of the discipline than can be provided by smaller, more “niche”-oriented programs.) This generally leads departmental faculty, in setting forth plans for the future, to take the position that growth in faculty size is the surest, if not the only, way to “get into the Top 10”. The system of rankings based on faculty reputation also leads to the practice of universities devoting a perhaps unhealthy fraction of their resources to raiding one another for faculty “stars”, with consequent limitation of the resources that would otherwise be available to provide the breadth of field coverage that is important to the education of Ph.D.s. The practice also limits the opportunities for tenure track faculty placement of our own Ph.D. graduates.

In addition, the current system of reputational rankings of research doctoral programs gives little or no information about the actual way in which these programs deliver Ph.D. education, e.g., the percentage of matriculants who actually complete the degree; time to degree; placement of graduates; fellowship vs. assistantship funding; health insurance, child care, and other important support systems for students; etc. For these reasons, Duke has taken the forceful position, along with many of its peer research universities, that the next NRC assessment of doctoral programs not be based significantly, if at all, on peer recognition of faculty reputation.

Nevertheless, the current sent of rankings is what we have to work with. Given them, what can we conclude about the broad trajectory in perceived faculty reputation of Duke’s Ph.D. programs?

First, nearly all of the Duke programs for which we have recent information appear to have achieved higher rankings in reputation than in those published about a decade ago by the NRC. The major improvements seen so far are in Electrical and Computer Engineering (up 31 positions, from 54 to 23); Philosophy (up 15 positions, from 44 to 29); Mechanical Engineering (up 12 positions, from 42 to 30); Mathematics (up 9 positions, from 34 to 25); Computer Science (up 8 positions, from 28 to 20); Neuroscience (up 6 positions, from 16 to 10); Political Science (up 6 positions, from 14 to 8); Sociology (up 6 positions, from 20 to 14); and Psychology (up 5 positions, from 33 to 28). It should be noted that four of the five greatest improvements have occurred in the Physical Sciences and Engineering, traditionally the weakest of the divisions of the Graduate School in terms of faculty reputational ranking and graduate student selectivity.

There has been relative stability or slight improvement in Duke's generally strong Ph.D. programs in Biology, as surrogate for the Biological Sciences as a whole at Duke (up 4 positions in the U.S. News rankings, from 16 to 12); Biochemistry (up 3 positions, from 15 to 12); Cell Biology (up 2 positions, from 14 to 12); History (unchanged at #15); Biomedical Engineering (unchanged at #4); and Literature (at either #2 or #1). Economics, a discipline that has been and remains a target for significant university investment because of its broad importance to the scholarly achievement of the university as a whole has not changed significantly as yet in reputation, at #21. Two other disciplines that are central to the life of any university in the natural sciences seem also not to have changed much, if at all, from their previous rankings: Physics, in the low to mid #30's (formally #32) and Chemistry in the high #30's to low #40's (formally #43).

Two departments showed significant declines in reputation between the 1995 NRC report and the most recent U.S. News rankings: English (down 7 positions, from 5 to 12), and Civil and Environmental Engineering (down 7 positions, from 27 to 34). Both have undergone substantial transformations in the interim period and are on a trajectory for improvement in reputation.

We have no firm information on the ranking of several Duke programs, but the opinion of external reviewers suggest that we have programs of near Top 10 quality or better in Cultural Anthropology, Art History, and Statistics. With its anticipated joint venture, a Duke-UNC joint Ph.D. program in German could be one of the most highly ranked in the nation. And we have almost certainly retained top 10, possibly even Top 5, status in Ecology, Religion, Pharmacology, and Romance Studies. We have probably also improved, or certainly not slipped, in Genetics and Music, and possibly Classics as well. It is likely that the relatively small graduate program in Earth and Ocean Sciences will remain one of the most poorly ranked at Duke.

Taken from a broader perspective, the Physical Sciences and Engineering, while still probably the weakest division at Duke, with only one or two departments in the top 20, has without question made the most progress in the past decade. There has also been improvement, if less dramatic, but from a much stronger base, in the Social Sciences, with all but two of its programs in the top 20, and two (three if you count Public Policy) in the Top 10. The Biological Sciences programs that have been ranked at all since 1995 have all shown improvement, several are of Top 10 quality, and all those in disciplines likely to be ranked at all, are at least in the Top 20. The Humanities, generally taken to be the strongest of the divisions within the Graduate School, have little new ranking information, but the weakest of the departments ranked a decade ago by NRC, Philosophy, has improved substantially (but is not yet Top 20), while English, which slipped badly in the late 1990's, has begun to approach Top 10 stature once again. While we still have some distance to go before we can be considered a truly top tier research university in most disciplines, it does appear that the investments that Duke has been making in faculty and facilities since 1995 are paying off in terms of reputation---simply put, in the great majority of cases, our

disciplines are more highly regarded by peers than they were a decade ago. All in all, the current picture and the outlook for the future is quite positive.

### C. Student Quality: Input Criteria

#### Humanities

The average selectivity for the Humanities Ph.D. programs improved from 18% to 15% from the period 1996-2000 to 2001-05, as the number of applications increased 18% and the number of offers actually decreased by 3%. At the same time, the average yields on offers of admission increased from 36 to 43%, and the Yield/ Selectivity ratio improved from 2.0 to 2.9. The number of matriculating students in this division increased by 16%, from 52 to 61. Although the average GRE Verbal declined from 662 to 647, the GRE Quantitative score improved from 648 to 658, for little net change in the GRE V+Q sum. The undergraduate GPA was unchanged at 3.6.

The departments with Yield/ Selectivity above the Graduate School median (2.7) for the 2001-05 period were Literature and English, both 5.0; Art History, 4.2; Philosophy, 4.0; and Religion, 3.2. All of these departments had selectivity of 15% or better (Graduate School median = 17%) and yields of 43% or more (Graduate School median = 46%). All five of these departments are either among the highest ranked (as determined by national rankings and/or the opinion of Duke external review teams) or the most rapidly improving departments in terms of faculty reputation at Duke.

The departments with considerably below-average Yield/ Selectivity were Music, 1.8; Romance Studies, 1.1; German, 0.9, and Classics, 0.6. Selectivity for this group ranged from 28% to 45%, and, with one exception, yields were also below average.

Although there was not, in general, much correlation at all between reputation and either GPA or GRE V+Q averages for incoming students in the different departments, it might be noted that two of the departments, Romance Studies (3.53/ 1137) and Art History (3.48/ 1204), matriculated students with both statistics at the bottom of the Humanities grouping, with GRE scores more than 100 points below the Graduate School median of 1338.

Consideration of the number of Duke competitive fellowships won per matriculant (for the period 2000-05) in a Ph.D. program as a criterion of student input quality gives a slightly different and more mixed picture for the Humanities. First, it should be noted that all of the Humanities programs matriculate students who win competitive fellowships at a rate equal to or greater than the Graduate School median (0.17).

Three of the four programs with the highest numbers for this parameter, Philosophy (0.48), English (0.43), and Literature (0.36), correlate with the Yield/ Selectivity ratios and reputational rankings cited above. However, the high numbers for Music (0.38), Romance Studies (0.33), and Classics (0.33) suggest that these units are able to matriculate a significant number of students of higher quality than either the more traditional input statistics or even the broad reputational rankings would suggest. Art History (0.25), Religion (0.20), and German (0.17) have the smallest ratios of fellowship winners/ matriculant in the Humanities.

## Social Sciences

The average selectivity for the Social Science Ph.D. programs improved from 13% to 10% from the period 1996-2000 to 2001-05, as the number of applications increased 26% and the number of offers increased by only 1%. At the same time, the average yields on offers of admission increased from 34 to 43%, and the Yield/ Selectivity ratio improved from 2.6 to 4.1. The number of matriculating students in this division increased by 26%, from 71 to 90. Although the average GRE Verbal declined from 630 to 619, the average GRE Quantitative score improved from 701 to 725, for a small increase in the GRE V+Q sum from 1331 to 1344. The average undergraduate GPA was unchanged at 3.6.

The departments with Yield/ Selectivity significantly above the Graduate School median (2.7) for the 2001-05 period were Cultural Anthropology (11.1), Psychology (8.6), and Business (5.9). Selectivity in these three departments, at 7%, 7%, and 8%, respectively, was the best in the Graduate School. The yields for all three were above the Graduate School median of 46%, and the yield for Cultural Anthropology, at 75% was the best in the Graduate School. One of these three departments, Business, is one of the most highly ranked at Duke; and a second, Cultural Anthropology, has been marked as a clear “comer”, truly outstanding in its areas of concentration for graduate education.

One should note that the selectivity for Psychology is somewhat unusual because of the very large number of applicants to the highly ranked (#11) Clinical Psychology program. The latter program has matriculated a substantial fraction of the new students in Psychology doctoral program at Duke over the past number of years, yet it is not these faculty (at least the Medical Psychology component) who dominate the faculty lists for Psychology at Duke that are the basis of the reputational rankings. Thus, for the current purposes, the reputational ranking for the relevant Psychology faculty should probably be considered to be somewhere in between the overall ranking for the department(s) and that of the Clinical Psychology component.

The remaining Social Science departments (which include some of the strongest departments at Duke in terms of reputation) had Yield/ Selectivity Ratios which did not differ substantially from the Graduate School median (2.7). All had selectivities better than the Graduate School median (17%), in the 12% to 16% range, but only Sociology had a yield (at 50%) that matched or exceeded the median Graduate School yield of 46%.

With the exception of Cultural Anthropology and, to a lesser extent History, the Social Science departments tend to emphasize GRE scores, particularly GRE Quantitative, more than do the Humanities. Thus Political Science and Business matriculate students with GRA scores (GRE V+Q = 1380 and 1376) significantly above the Graduate School median (1338). There is not a great deal of difference in the GPA's of matriculating students in any of the Social Science departments.

Consideration of the number of Duke competitive fellowships won per matriculant (for the period 2000-05) in a Ph.D. program as a criterion of student input quality gives a somewhat different picture, although Cultural Anthropology, which has the highest number of fellowships/ matriculants of any Ph.D. granting program at Duke (0.52), continues to top the Social Sciences in this measure of student quality as well. In addition, Psychology, with its highly regarded Clinical Psychology component, exhibits a ratio (0.24) above the Graduate School median. On the other hand, History (0.39) and Political Science (0.25), both with strong national reputations but less impressive traditional input statistics, also have fellowship/ matriculant ratios significantly above the Graduate School median.

What might be more surprising than these statistics is the extremely small number of fellowship winners per matriculant won by the highly ranked doctoral programs in Business (0.04) and Sociology (0.07), as well as the near Top 20 Economics program (0.03).

### **Biological Sciences**

The average selectivity for the Biological Sciences Ph.D. declined slightly from 20% to 21% from the period 1996-2000 to 2001-05, as the number of applications increased 44% and the number of offers increased by 50%. At the same time, the average yields on offers of admission increased from 43 to 46%, leaving the Yield/ Selectivity virtually unchanged at 2.1. As might be expected from these numbers, there was a large increase in the size of the matriculating classes in this division, from 92 to 148, or 61%. The average GRE Verbal declined from 616 to 599, while the average GRE Quantitative score improved from 719 to 735, leaving the GRE V+Q sum essentially unchanged at 1344. The average undergraduate GPA was unchanged at 3.6.

The departments and programs with Yield/ Selectivity significantly above the Graduate School median (2.7) for the 2001-05 period were Biological Anthropology and Anatomy (4.3), Environment (4.3), Biology (3.5), Ecology (3.4), Molecular Cancer Biology (3.4), and Computational Biology and Bioinformatics (3.3). Selectivity and yields in all of these units were equal to or better than the Graduate School medians of 17% (range from 12% to 17%) and 46% (range 47% to 61%), respectively. Although exact rankings are unclear in all cases, in part due to the confusing taxonomy used for such purposes, all of the departments are among the most highly regarded in their fields, as is the Ecology program. It can be noted that the last three units named are all interdisciplinary Ph.D. granting programs created to provide applicants the opportunity to come to Duke to study in an exciting new interdisciplinary area without having to necessarily make a choice of departments to do their Ph.D. dissertation work.

Four other Biological Science programs, including the highly ranked departments of Pharmacology and Neurobiology, the newly formed admitting program in Cognitive Neuroscience, and the unranked departmental program in Pathology had Yield/ Selectivity ratios which did not differ significantly from the Graduate School median. The remaining Biological Science departments and programs all exhibited Yield/ Selectivity ratios well below the Graduate School median. Among these, somewhat surprisingly perhaps, were the highly ranked programs in Biochemistry (1.3), Genetics and Genomics (1.7), and Cell and Molecular Biology (1.5). Selectivity in the latter three units was in every case about 27%, and yields ranged from 36% to 46%.

Most of the Biological Science programs did not have GRE V+Q scores that deviated a great deal from the Graduate School median of 1338, with the notable exceptions of Cognitive Neuroscience (1455, but it is newly formed and has admitted only one class), Neurobiology (1426), Structural Biology and Biophysics (1415) on the high end, and Biological Chemistry (1167---admission into this program has temporarily been suspended), Developmental Biology (1282), and Biochemistry (1285) on the low side.

GPA's did not deviate by more than 0.1 from the Graduate School median of 3.6 in any of the biological science programs, with the exception of the one admitted class in Cognitive Neuroscience (3.9) and the new program in Medical Physics (3.4).

With respect to competitive Duke fellowships per matriculant, the very small admitting programs in Structural Biology & Biophysics and the new program in Cognitive Neuroscience stand head and shoulders above the other units, with ratios of 0.78 and 0.50, respectively. The Ph.D. granting programs in Ecology (0.30) and Computational Biology and Bioinformatics (0.25) are also above the Graduate School median, reflecting once again the apparent wisdom of Duke's decision to place substantial bets in recent years on such degree-granting structures.

The newly authorized admitting program in Integrated Toxicology (0.23) is also above the median in this statistic, as are the Biology and the Biological Anthropology and Anatomy departmental doctoral programs, at 0.36 and 0.35, respectively.

What is puzzling is the poor record of the rest of Duke's biological science programs, including some of the most highly rated ones, to be able to matriculate very many students who can win these awards.

### **Physical Sciences and Engineering**

For the purposes of this discussion, we will consider the Physical Sciences and Engineering departments separately from one another because the results are significantly different between the two groupings.

#### **Physical Sciences:**

The average selectivity for the Physical Sciences Ph.D. programs improved from 32% to 21% from the period 1996-2000 to 2001-05, as the number of applications increased 46% and the number of offers actually decreased by 3%. At the same time, the average yields on offers of admission increased from 30 to 36%, and the Yield/ Selectivity ratio improved from 0.9 to 1.7. [Note that, even with these improvements, all of these measures are considerably below the Graduate School medians.] The number of matriculating students in this division increased by 15%, from 60 to 69. The average GRE Verbal increased from 575 to 588, while the GRE Quantitative score improved from 752 to 764, for a total increase in the GRE V+Q sum from 1327 to 1351. The undergraduate GPA was unchanged at 3.6.

Only two Physical Science departments, Computer Science (3.2) and Statistics (3.0) had Yield/Selectivity ratios greater than the Graduate School median of 2.7. These departments were also the only ones with selectivity better than the Graduate School median of 17% (Computer Science, 13%; Statistics, 16%). Only Statistics had a higher yield (48%) than the Graduate School median of 46%. The GRE V+Q was significantly greater than the Graduate School median only in Computer Science (1414). None of the programs had GPA's that differed by more than 0.1 from the Graduate School median of 3.6. These data correlate well with the results of the reputational rankings that we have available, which puts Computer Science as the only physical science department in the Top 20, and Statistics as a department that, although formally unranked, is viewed as a program at or near the Top 10 by external reviewers.

Statistics is the only doctoral program in the physical sciences that has been able to matriculate students with a ratio of competitive Duke fellowships per matriculant (0.19) greater than the Graduate School median (0.17).

**Engineering:**

The average selectivity for the Engineering Ph.D. programs improved from 20% to 18% from the period 1996-2000 to 2001-05, as the number of applications increased 41% and the number of offers increased by 25%. At the same time, the average yields on offers of admission increased from 49 to 52%, and the Yield/ Selectivity ratio improved from 2.4 to 2.9. The number of matriculating students in this division increased by 25%, from 49 to 66. The average GRE Verbal score decreased slightly from 573 to 571, while the GRE Quantitative score improved from 761 to 772, for a total increase in the GRE V+Q sum from 1333 to 1344. The undergraduate GPA was unchanged at 3.6.

As might be expected Biomedical Engineering exhibited a Yield/ Selectivity ratio (4.6) significantly greater than the Graduate School median of 2.7. Its selectivity (14%), yield (63%), GRE V+Q (1366), and GPA (3.7) were also above the Graduate School medians. These statistics are in keeping with the ranking of Biomedical Engineering as one of the top programs in the nation.

The Yield/ Selectivity ratios for Electrical and Computer Engineering and for Civil and Environmental Engineering are not significantly different from the Graduate School medians. In both cases, the selectivity (at 19%) is only slightly below the median, while the yields (about 51%) are higher than the median. GRE V+Q scores and GPAs for the two departments also do not differ significantly from the Graduate School median.

The Yield/ Selectivity for Mechanical Engineering and Materials Science (1.6) is significantly below the Graduate School median, as are all of the statistics—in each case the worst in Engineering: Selectivity (25%), Yield (39%), GRE V+Q (1285), and GPA (3.46). Given the apparent improvement in the national ranking of this department (though it is not yet into the 20's), the student input statistics are somewhat puzzling.

Biomedical Engineering, as might be expected, has a ratio of competitive Duke fellowships per matriculant (0.27) that significantly exceeds the Graduate School median. Civil and Environmental Engineering is just above the median (at 0.18), but the other departments have been far less successful in recruiting this category of student.

**D. Student Quality: Academic Placements****Placement of Duke Ph.D.s in Top 25 NRC Ranked Departments in the Discipline**

We have compiled data on the placements of all Ph.D. graduates of Duke University for the period 1991-2000. The data reflect the positions held as of September 2004. In this section, we present, as a possible measure of evaluation of the quality of graduate programs, their record in placing their graduates in tenure track faculty positions at Top 25 Research Universities in their own discipline (as defined in the 1995 NRC rankings).

Duke does not do very well in this regard. The Top 25 placements for the Graduate School as a whole represent only 6% of all Ph.D.s graduated in that period. In the Humanities and in the Social Sciences, such placements represent 9% of graduates; in the Biological Sciences and in Engineering, 5%; and in the Physical Sciences, 2%.

The highest such placement percentages (at or above the Graduate School average of 6%) were for Literature, 23%; Business and Biological Anthropology and Anatomy, 17%; Political

Science, Sociology, and Cultural Anthropology, and Biomedical Engineering, 16%; Religion, 14%; Immunology, 13%; Molecular Genetics and Microbiology, 12%; Statistics, 10%; Pharmacology, 8%; History, 7%; and Biology, 6%. All of the departments with these high Top 25 placement percentages are among the most highly regarded at Duke (within the top 20 according to the 1995 NRC and 2001-05 USN rankings, or where there has been no such published ranking, according to the opinion of the most recent external review report for the department). The placement of Cultural Anthropology, Biological Anthropology and Anatomy, and Statistics in this group ratifies the high opinion of these departments held by external reviewers.

The small number of Top 25 placements in departments as highly regarded as English (5%) and Romance Studies (5%) during much of the period 1991-2000 is surprising (although it was indeed predicted by an external team reviewing Duke's English department in 1992 that its graduates, though clearly of high intellectual quality, were too narrowly trained for them to be readily hired at top research universities). A number of highly ranked programs in the Biological Sciences, such as Neurobiology, Biochemistry, and Cell Biology, placed only 0-3% of their graduates in Top 25 positions. [In the case of the highly regarded programs in Ecology, Art History, and Genetics, the programs were too new to have had more than a very few Ph.D. graduates in the 1991-2000 period.] We should recognize, however, that in the biomedical disciplines, the normal academic path is for a new Ph.D. to take several more years of postdoctoral study, and it is often the case that Duke biomedical departments lose track of their graduates after the first few years following their graduation from Duke.

#### **Overall Academic Placements of Duke Ph.D.s.**

40% of Duke Ph.D. graduates for the years 1991-2000 were placed in tenure track faculty positions at all types of universities or colleges by September 2004. Such academic placements were the norm in the Humanities and the Social Sciences, where 74% and 57%, respectively, of graduates found such jobs. On the other hand, tenure track faculty positions were the exception for Duke Ph.D.s in the Biological Sciences (24%), Physical Sciences (21%), and Engineering (21%).

The departments placing at least the Graduate School average of 40% of their graduates in tenure track faculty positions at any university or college were: Philosophy, 86%; Business, 82%; Literature, 79%; Classics, 77%; English, 76%; Religion, 75%; Political Science, 72%; Romance Studies, 66%; History, 62%; Sociology, 61%; Music, 59%; Cultural Anthropology, 52%; Economics, 45%; Math, 43%; Neurobiology, 41%; and Biology, 40%. Note that only three departments in the Biological or Physical Sciences and Engineering are in this group.

Although it is often expected that a Ph.D. graduate from an institution such as Duke becomes a tenure track faculty member at some type of research or doctoral university, this is not the norm in any division of the Graduate School. For the Graduate School as a whole, only 26% of Ph.D.s graduating in the years 1991-2000 were placed in such positions by September 2004. The percentages in the divisions were: Humanities, 39%; Social Sciences, 42%; Biological Sciences, 19%; Engineering, 18%; and Physical Sciences, 11%.

The departments placing at least 25% of their graduates in tenure track faculty positions at a research or doctoral university were: Business, 78%; Literature, 62%; Political Science, 51%; Philosophy, 46%; History, 44%, English, 43%; Sociology, 43%; Classics, 41%; Neurobiology, 41%; Romance Studies, 37%; Economics, 33%; Environment, 33%; Cultural Anthropology,

32%; Music, 31%; Biology, 26%; and Immunology, 25%. Note that no departments in the Physical Sciences and Engineering are in this group.

***E. Correlation between Reputational Rankings and Measures of Student Quality***

It may be of some interest to examine whether or not there is any significant correlation between the reputational rankings of Duke doctoral programs and the various possible measures of student quality described above. The results are somewhat different for the Humanities and Social Sciences disciplines as opposed to the Physical and Biological Sciences and Engineering programs.

We found little or no correlation between the most recent reputational rankings and input measures of student quality for the set of Humanities and Social Sciences doctoral programs at Duke ( $R^2 = 0$  to  $0.1$  for Undergraduate GPA, Matriculant GRE Verbal + Quantitative Scores, Selectivity, Yield/Selectivity, or Competitive fellowships per matriculant). There was a much larger correlation between the reputational rankings and the record of tenure track faculty placement in top 25 research departments in the discipline ( $R^2 = 0.4$ ).

In the Sciences and Engineering programs, there was little correlation between Matriculant GRE V+Q Scores or Competitive Fellowships per Matriculant with the reputational rankings of the graduate programs ( $R^2 = 0.1$ ), and not much more between rankings and Selectivity or Yield/Selectivity ( $R^2 = 0.2$ ). Although, again, there was a higher correlation between reputational rankings and tenure track faculty placements in top 25 research departments ( $R^2 = 0.3$ ) than with these specific student quality input criteria, in the Sciences and Engineering, there was a significant correlation ( $R^2 = 0.5$ ) between the rankings and the undergraduate GPA of matriculants into the program.

In neither broad disciplinary groupings was there much correlation between reputational rankings of graduate programs and the ability of programs to place their Ph.D. graduates into tenure track faculty positions in all colleges and universities ( $R^2 = 0$  to  $0.2$ ) or even into the full array of research and doctoral universities ( $R^2 = 0.1$ ).

These results suggest to us that the system of reputational rankings of doctoral programs does not pay particular attention to the results of commonly used methods of assessing the quality of incoming students, or, more to the point, those measures (with the one exception noted) do not seem to be particularly effective in predicting which students are likely to succeed, not only in graduating with the Ph.D., but in obtaining tenure track faculty positions in top-level research institutions.

***F. A New Assessment of Research Doctoral Programs by the National Research Council***

The national assessment of the quality of research doctoral programs conducted every dozen years or so by the National Research Council is often considered by faculty and administrators to be the “gold standard” for determining the quality of such programs. Although in the assessment published in 1995 (based on faculty and student information that had been collected in 1993), there actually was a significant amount of quantitative data collected and published pertaining to the individual Ph.D. programs themselves (i.e., number of Ph.D.s produced, students enrolled, time to degree, percent of students receiving financial support as RA’s or TA’s, demographics, number of faculty, number of faculty publications and citations, percent of faculty with research support), and faculty were asked to assess the quality of educational programs at other institutions, little attention has been paid to any of this information. In part, this is because the quantitative data published was of such a general and aggregated nature that it was not terribly

useful in detailed comparison of programs. But, for the most part, attention has been paid to the ratings of the perceived quality of the faculty in individual programs by peers in the discipline, ratings that were averaged by the NRC to derive a set of reputational rankings for the quality of the Ph.D. program(s) in a given field at each institution. (The peer assessment of the quality of the “education” that could be obtained at these programs turned out to correlate better than 97% with the reputational rankings of “faculty” quality, as might be expected, since peer faculty in a discipline generally know very little of how Ph.D. education is actually delivered in other institutions, but they do know whether or not they recognize the names of program faculty that appear on a list provided by a peer institution.)

Another important characteristic of the 1995 NRC assessment is that it defined “fields” to be assessed, rather than individual Ph.D. programs. Thus, when institutions had programs which spanned more than one field in the NRC taxonomy, the faculty in those programs were divided among those fields--or, more often, were included in both fields on lists provided by the institution to the NRC. An example at Duke would be the Biology Ph.D. program (then the Botany and Zoology doctoral programs), in which some of the faculty were put in the field termed “Ecology, Evolution, and Behavior” and others in the fields “Cell Biology & Development”, “Biochemistry & Molecular Biology”, and/or “Molecular & General Genetics”.

When institutions had more than one program in a given NRC field, the faculty in those programs were combined on the list provided to the NRC for that field. An example at Duke would be the field termed “Anthropology”, which included faculty from the separate Ph.D. programs in Cultural Anthropology and Biological Anthropology & Anatomy. Another example at Duke would be the field of “Ecology, Evolution, and Behavior”, which included some faculty from Duke Ph.D. programs in Environment, Botany, Zoology, and BAA. A third would be “Cell and Developmental Biology”, which included faculty from the separate Duke Ph.D. programs in Botany, Zoology, Cell Biology, Immunology, Microbiology, and nearly all of the other biomedical Ph.D. programs. The student and faculty data from the individual Ph.D.-granting units associated with these faculty were aggregated to provide a set of average numbers for each parameter in each NRC field. In this situation, the characteristics of any real Ph.D. program to which a student can apply are entirely lost. It has been clear that the NRC was not truly interested in assessing the quality of the delivery of graduate education in specific doctoral programs, but was focused on ranking the quality of research (as determined by faculty reputation) in broad disciplinary fields.

The ranking of disciplines may be a valid objective, but it is not at all the same as an assessment of the quality of “Research-Doctorate Programs in the United States”, as the 1995 NRC report is entitled. Graduate deans throughout the nation have objected vociferously to this process. They have insisted that the NRC, in any new assessment of research doctoral programs, publish information that will be useful to students interested in applying to real Ph.D. programs that they wish to compare. Such information (particularly if used to construct “rankings”) might also provide a benchmark for Graduate Schools to use in attempting to monitor Ph.D. completion rates, time to degree, financial support, etc., in their own programs in each field. It is not clear as yet whether the NRC will substantially change its fundamental methodology in the new assessment.

What is clear, however, is that universities, departments/programs, faculty, and graduate students will be asked to provide (through Web-based surveys) a great deal more information about themselves than was collected in the previous NRC assessment process. A database containing this type of information would be of tremendous use in assessing the state of both doctoral education and faculty scholarship in fields as described in the new NRC taxonomy.

(The taxonomy for the biological sciences is, as before, as mess! For example, there is no field termed “Biology” per se, and the Duke faculty in that highly regarded department would be split among several NRC-defined fields. The characteristics of the Biology Ph.D. program, as actually experienced by students, would be entirely obliterated. A different example is given by the proposed new NRC field of “Molecular Biology”. At Duke, there is no Ph.D. given with that name, so in order to be ranked, faculty lists would have to be derived from faculty in other degree-granting programs. The reality is that “molecular biology” is a tool used by faculty in most of the biological science graduate programs at Duke or anywhere else. So there is nothing about a “Molecular Biology” ranking that would give information about the faculty of any real graduate program unit at Duke. To see if this situation was unique to Duke, we looked at the titles of Ph.D. programs in the biological and biomedical sciences at eight of our peer private research universities. We found eleven degree programs with “Molecular Biology” in the title, but every one of those programs had the name of one or more other NRC fields also in the title. There was not a single degree granting program in nine elite universities that gave a Ph.D. called “Molecular Biology”. Is this what you call a field for assessment of “research doctorate programs”?)

As it now stands, although information will indeed be collected for individual programs, it is not yet clear whether or not the process of aggregating faculty from different doctoral programs or splitting faculty in one program into multiple fields will be changed. It also appears that there will be some type of reputational survey, but it is not clear as to how this will actually be used.

Nevertheless, Duke has (reluctantly!) chosen to participate in the new NRC assessment process. This will mean that the Graduate School will need to coordinate collection of and report on data pertaining to the institution as a whole and construct faculty lists for individual programs this Summer and early Fall. Soon after that, data will need to be provided on quantitative characteristics (e.g., number of Ph.D.s, completion rates, time to degree, student support characteristics, research support and space!, etc.) for individual departments and programs. Finally, during the Fall Semester, detailed questionnaires will be sent (via Web) to all faculty on the program lists, asking such questions as number of publications, where they got their degrees and had previous jobs, students they supervised for Ph.D. dissertations, and much, much, more! It is also anticipated that surveys will be sent to enrolled Ph.D. students in a small number of selected fields in order to obtain information as to their specific experiences in their individual programs. This is a formidable undertaking for the institution, and we better be prepared for it. Most immediately, we need to decide, as soon as the final taxonomy and methodology to be used by the NRC is set (probably by the end of March), how we will correlate our set of Ph.D. programs and their associated faculties with the NRC-designated fields.

When all of this is over, and results are published---probably in 2008 or 2009---we will have a new set of ratings of “program quality”. It is not clear whether this information will be any more useful than that which we obtain through our own processes of external review, but we will probably not be free to ignore it either.

### ***G. Program Review at Duke***

Although a system of external review of departments and programs at Duke was initiated by then Provost Phillip Griffiths in the mid-1980’s, this process was sporadic and actually had been discontinued by the time Lewis Siegel became Dean of the Graduate School in 1991. One of the points on which he insisted on assuming the position as Vice Provost and Dean was that his office (by virtue of its Vice Provost component) be given a charge by the Provost to coordinate a

thorough all-inclusive review process of each academic program at Duke. The reviews were to involve a thorough self-study by the unit itself, a visit and report from a team of distinguished scholars in the discipline, a response to the from the faculty in the unit, consideration of the review and advice to the administration by appropriate faculty committees, a decision by the appropriate administrators (Provost, relevant deans, and department chairs) on how to deal with the unit based on this information, and, finally, a written memorandum of understanding that describes commitments to be undertaken by both the administration and the unit in the period between reviews. This process took some years to fully put into place, but it now proceeds essentially as just described.

Since 1991, all academic units associated with undergraduate education and/or Ph.D. degrees have been reviewed at least once. Most have been reviewed twice, and a third round of reviews for many of those units is well under way. The average period between reviews has been about 6 to 7 years, although this has been quite variable due to changes in departmental leadership, leaves, reorganization of units, etc. The programs and departments in Arts and Sciences, the Basic Medical Sciences, Engineering, Nicholas, and the Ph.D. programs in Business (Fuqua) and Religion (Divinity and A&S) are now being reviewed on a regular schedule of about 6 years between reviews.

The faculty committees that consider the review reports are the Academic Programs Committee and, for the purposes of considering things that impact the graduate program (if any), the Executive Committee of the Graduate Faculty. There is sometimes also consideration of reviews, as originally envisioned, by faculty committees associated with governance in the individual schools (e.g., the Basic Science Faculty Steering Committee, the Engineering Faculty Council, etc.), but this practice is by no means uniform. The quality of consideration and advice by the committees is quite variable. While representatives of the APC and ECGF are invited to consider the self-study, work in finalizing the charge to be given to the external team, and meet with the external team itself during its site visit, it often happens that the individual(s) designated to do these things has rotated off the parent committee when it comes time to consider the report of the external team and the response in the next academic year. There also is no regularized set of information about the unit that is given to the APC or ECGF for each review under consideration.

These are defects that can be fairly easily rectified, and they should be as soon as possible. It is particularly important that there be a serious effort to reduce the period of time that elapses between the date of the site visit and the conclusion of the process with the MOU. This period, which is usually about one academic year, has occasionally stretched out to two or three, and this makes the findings of the review almost useless in these situations.

The Graduate School, through the appointment of its Dean as a Vice Provost, we believe remains as the most neutral locus for assessment of the quality of academic programs in the university, and we strongly urge that the responsibility for coordination and oversight of the external review process remain with that position. We do believe that consideration might well be given to a stronger and more direct role for faculty advisory committees in the external review process itself. It is not unusual at other universities for faculty members, designated by the Provost with the advice of the chair of a committee such as the APC and/or ECGF, to participate more actively in the review process itself, such as being included in the interviews conducted by the external team with department chairs, DGS's and DUS's, students, and, sometimes, with individual departmental faculty or faculty groups. A faculty member designated to participate in the review process itself would be responsible for reporting on the review to the parent committee at all stages of the process, even if that faculty member has since rotated off the committee. We

believe that such closer involvement of the faculty would significantly improve its ability to give the best advice possible to the administration on the program under review.

## IV. PROGRAMMATIC INITIATIVES

### A. New Graduate School programs created since the 2000 Plan

Graduate education, particularly at the Ph.D. level, must always lie at the frontiers of scholarly inquiry. As new fields and interdisciplinary combinations of existing fields emerge, the structure of our graduate degree and certificate offerings must change as well. The past five years have seen an unprecedented period of development of new graduate programs in the Graduate School--21 new graduate degree or certificate programs have been created since submission of the 2000 Plan. (In addition, the Graduate School has re-organized, renamed, and/or changed the admitting status of 6 others). These include:

*5 Ph.D.-granting programs:* Ecology; Computational Biology & Bioinformatics (originally named Bioinformatics & Genome Technology); Medical Physics; Nursing; and Public Policy Studies.

*3 Ph.D.-admitting (but not degree-granting) programs:* Developmental Biology, Biological & Biologically Inspired Materials, Cognitive Neuroscience.

*11 Ph.D. certificate programs:* Developmental Psychology (joint with UNC-CH); Education Policy Research; Slavic, Eurasian, & East European Studies; Teaching College Biology, Advanced Quantitative Methods in the Social Sciences; Nanoscience; Photonics; European Studies; Philosophy of Biology; History and Philosophy of Science & Technology; Information Systems & Information Science.

*2 Masters-level programs:* East Asian Studies; Medical Physics.

*6 Reorganized and/or renamed programs:* Molecular Genetics & Microbiology (Ph.D.-granting, formed from the former departments of Genetics and Microbiology); Latin American & Caribbean Studies (broadened and renamed Ph.D. certificate), Genetics & Genomics (Ph.D.-granting program, broadened and renamed); Integrated Toxicology (program granted Ph.D. admitting status); Structural Biology & Biophysics (renamed); Biomolecular & Tissue Engineering (renamed).

Then new or altered programs span all four divisions of the Graduate School: Humanities, 5; Social Sciences, 7; Biological Sciences, 9; Physical Sciences & Engineering, 6. (It is difficult to tell where some of these programs—e.g., ISIS---should be placed within the four somewhat arbitrary divisions of the Graduate School.) One might note the seemingly unusual divisional placement of some of these programs. For example, the new Ph.D. in Nursing is placed in the Social Sciences because its program of Ph.D. research is most closely related to disciplines in that division, rather than the Biological Sciences. The new Ph.D. in Medical Physics, though housed primarily in two clinical departments in the Medical School (Radiology and Radiation Oncology), is more closely related to graduate work in Biomedical Engineering and in Physics than to that in the Biological Sciences, and, as a result, the new program is placed in the Physical Sciences.

It is also evident that the great majority of the new programs (including degree-granting units) are interdisciplinary in nature; i.e., they involve participation of faculty from more than one department, and, in many instances, from more than one school. There is also a trend toward the creation of Ph.D. programs in disciplines where the research has direct applications to professional practice—e.g., Nursing, Medical Physics, Public Policy. It should also be noted that the Nursing and Medical Physics Ph.D. programs represent the first time that the Graduate School has authorized the doctoral degree in units of the Medical Center that lie outside the basic medical sciences. The trend toward graduate programs in more “applied” fields and bridging basic and clinical practice continues in some of the new graduate program initiatives described below.

### **B. Possible New Graduate School programs or programmatic initiatives**

Given this spurt of new programmatic activity, which has involved (and will continue to involve over the next several years) a significant commitment of Graduate School resources that might otherwise go to support more traditional department-based graduate programs, it might well be time to call a moratorium on the creation of new programs that might require institutional financial support. The possible loss of Graduate School revenue should the M.P.P. and M.A. in PIDP programs be transferred to a new Sanford School of Public Policy, as well as the tremendous call on resources raised by the need of the Graduate School to significantly increase the value of the financial support packages that it must offer to students in order to remain competitive for high quality applicants (see below) also should create a sense of hesitation in creating very many new programs in the Graduate School in the next few years unless these can be supported virtually entirely without Graduate School funds (e.g., with training or research grants, endowments, Masters student revenues, etc.).

Nevertheless, the intellectual activity at a university such as Duke must never stop. In spite of these cautions, the Graduate School believes that a number of significant proposals that call for new graduate-level programs or increased programmatic activity in existing programs---most, but not all, of which have been raised, explicitly or implicitly, in the various School strategic plans---must be placed on the table for serious consideration if the intellectual vigor of Duke as a community devoted to excellence in research and graduate education is to be maintained. We envision that future programs will emphasize interdisciplinary training and will explore opportunities for broadly educating our students, including developing more options for international training experiences.

## **HUMANITIES**

### **Franklin Humanities Institute**

Starting with the work of the Literature Program faculty who were brought to Duke in the 1980’s, cross-disciplinary approaches in most of the Humanities Ph.D. programs at Duke have simply become second nature to the faculty, without the necessity to create very many new formal interdisciplinary programs to accomplish this. In 1999, Duke decided to support the Humanities and allied disciplines by creating the Franklin Humanities Institute to provide a physical location, excellent facilities, and financial support that would significantly enhance the ability of faculty and students to engage in focused interdisciplinary efforts. In its brief existence, the FHI has done exactly that. We will focus here only on those initiatives that directly affect graduate students and graduate education. Compared to the efforts of the SSRI, which incorporated graduate student education and support into its program from the beginning, the FHI, while

providing some important opportunities for graduate students in the Humanities to participate in its programs, has not been as active in this area.

The Franklin Seminars---year-long seminars built on a collaborative model of inquiry around a unifying theme---have included graduate students as research fellows, along with faculty, post-docs, and others. Each seminar series has been organized around very broad themes that last for four years. The themes so far have been “Race” and “Information”. Graduate students receive some financial support to participate in the Seminars, and they have found the seminar experience useful to develop teaching skills and helpful on the job market. In six years, the Seminar series has supported 27 research projects by graduate students, the majority of which were incorporated into their dissertations.

The FHI has also supported Dissertation Working Groups, with some stipend support, to permit advanced graduate students to discuss their work and receive constructive criticism. The FHI has proposed to double the number of students who can be supported to participate in these groups, and this would be a wonderful thing to do.

After discussion with the Graduate School, the FHI now is open to establishing a number of interdisciplinary humanities fellowships that would give Ph.D. students the opportunity to develop their dissertation research projects within the exciting interdisciplinary environment of the FHI. The Graduate School would welcome and try to provide support for such a project, particularly if some thought were given by FHI as to how to make a year spent at the FHI a more structured experience (e.g., a graduate certificate program).

### German Studies

The German Studies Ph.D. program, begun only in 1991, has the fewest enrolled students of any degree-granting doctoral program in the Graduate School. The faculty in the department of Germanic Languages and Literatures is small, and could not, by itself, support a Ph.D. program. As a solution to this problem, the Ph.D. in German Studies program was structured to be a broad program, involving faculty in many disciplines, in which the common factor is that the object of study is something German. Skills in the German language are required, but the dissertation can be on history, literature, philosophy, art, science, etc. The students entering the German Studies Ph.D. program, though few in number, have generally been strong. They were attracted to Duke by the interdisciplinary conception of the graduate program, which, in time, included not only participation by affiliated faculty at Duke, but by faculty in the larger (and much more traditional) German Studies program at UNC-CH. The Duke Ph.D. program in German Studies is probably most strong in medieval and early modern studies, intersections of German philosophical and literary traditions with visual culture and music; Holocaust studies; and the study of the effects of literature and culture on science and technology.

Recognizing the fact that German Studies is a relatively small field in terms of the number of Ph.D.'s produced each year, and given the complementarity in interests of the German faculties at Duke and UNC-CH, the two German departments have been actively engaged in planning to create a joint Ph.D. Program in German Studies for the two universities. Clusters of research strengths represented by the combined faculties would include: European intellectual history; German philosophical traditions; Modernism; Romanticism; medieval and early modern studies; Holocaust studies; gender and sexuality studies; visual culture; literary theory and poetics; and German-Jewish studies. The two university administrations have been supportive of this initiative, and all involved believe that the combined unit would immediately become one of the very best in the nation. The Graduate School expects the creation of the joint degree program to

occur within the next two years and to be successful. If so, it is a model that could well be emulated by other small doctoral programs at the two universities.

#### The Arts and Sciences “Themes” for Faculty Development in the Humanities and Social Sciences

The Arts & Sciences Strategic Plan envisions faculty hiring in the next few years to be clustered around several themes that would guide a significant proportion of faculty searches in the departments. While it is clear that creating a group of faculty with such a focus would indeed foster interaction between faculty (and graduate students) in different departments, it is not clear that there would be any utility in creating new formal graduate programs in each of these areas. Thus, the Graduate School does not anticipate a request to consider (or to foster) such programs in, say, Trans-cultural Studies, or Visual Culture.

One area that would seem to be suitable for a formal interdisciplinary program would in the theme Individual and Collective Ethical Behavior. Given the many initiatives at Duke in the general area of Ethics---e.g., the Kenan Institute for Ethics, GELP, the Divinity School’s Center at the End of Life; the Hart Leadership Program in the Sanford Institute; the Duke Human Rights Initiative---and Duke’s faculty strength in departments such as Philosophy, Political Science, Medicine, etc., that could contribute to such a program, it is surprising that so little attention has been paid to the possibilities of graduate education in this important area.

#### Slavic and Eurasian Studies

The Graduate School discontinued admission into the small Ph.D. program in Slavic Languages and Literatures (established in 1991) because of the lack of sufficient faculty and critical mass of students to make such a program viable at the level of quality Duke expects of its graduate programs. Admission into the M.A. program in Slavics was continued, although very few students have matriculated into this program in recent years. Recently, the faculty of the Slavics department has proposed to the Graduate School a new Ph.D. program, broader and more interdisciplinary in concept, to cover Slavic and Eurasian Studies, with emphasis on a geographic region that spans from Eastern Europe through Turkey and the Caucasus to the Central Asian republics of the former Soviet Union. It has also been suggested that this new Ph.D. program might be offered jointly with the Slavics Ph.D. offered by the larger faculty in that discipline at UNC-Chapel Hill, in an arrangement similar to that proposed by the German Studies program. There has been a long history of cooperation in Slavic studies between the two universities through the cooperative Title VI area studies program funded by the federal government for many years. The Graduate School will consider seriously these proposals in the near future. It will need to make sure, however, that a program covering the broad range of cultures proposed makes intellectual sense, will have sufficient faculty resources, and a potential student clientele that would make it a successful initiative for Duke.

### **SOCIAL SCIENCES**

#### Social Science Research Institute

The Social Science Research Institute has already done a great deal to foster interaction across the social science disciplines through its graduate certificate program in Advanced Quantitative Social Sciences, which provides training for students from multiple disciplines in quantitative methods. Graduate students have benefited from the Faculty Fellows Program which has fostered year-long projects of research on broad social science themes. SSRI now proposes to expand its programming by creating a Center for Advanced Research in the Social, Behavioral, and Life

Sciences, which would sponsor three year projects that involve research on an issue that is of theoretical and empirical importance but also interacts with a critical concern facing society (example: social bases of disease transmission – re HIV/AIDS, obesity). Each project would be targeted to involve at least three graduate student fellows/RA's and would bring these students into dialogue with Duke faculty, scholars from around the world, practice-oriented professionals and policy experts in relevant areas, and postdoctoral fellows in the process of researching these important issues. Participation would involve faculty and/or students from disciplines such as Psychology, Economics, Political Science, Sociology, History, Business, Law, and Medicine.

SSRI also proposes to coordinate less advanced methodological training in social sciences (statistical analysis, computational methods, game theory, decision theory, etc.) through offerings of a Duke Institute for Social Science Statistics, for both undergraduates and graduate students. It is likely that graduate students would be needed, at least as T.A.s, for this activity, and the proposal calls for four graduate student stipends to be assigned to this project.

SSRI also wants to continue and expand the Summer Institutes in Empirical Implications of Theoretical Models---which has been NSF funded and targeted primarily to Political Science up to now---to the broad range of Social Science disciplines participating in SSRI. The program envisions workshops on research frontier themes of interdisciplinary interest and month-long work on a research project. 25 graduate students from Duke and elsewhere would be involved, and summer support for them would be required. (Other universities, such as Michigan and UC-Berkeley, may co-sponsor this project with Duke.)

These initiatives build on the success of the SSRI-associated Duke Initiative in Interdisciplinary Social Psychology, which has been given substantial stipend funding by the Graduate School as part of the university's commitment to invest heavily in this field through multiple units (Psychology and Business are the key players here). While it is to be hoped that the SSRI initiatives can lead to increased external funding for Duke Ph.D. students in the Social Sciences, it is almost certain that additional funding for doctoral students from the Graduate School will be required.

### Neuro-Economics

There is broad interest at Duke by faculty in Economics, Business, Psychology, and the Medical Center in the emerging field of "neuro-economics", in which sophisticated imaging techniques, such as functional magnetic resonance imaging (fMRI), are being used to investigate which parts of the brain are active when a person has to make a choice, particularly when some risk is involved. This is obviously something that faculty in the strong Duke area of the psychological basis of Marketing would have interest in, as would pharmacologists, psychologists, and psychiatrists who wish to intervene when this process goes awry (*Shades of Big Brother???*). There are links to the study of cognitive linguistics and other fields as well. Duke has invested heavily, through the Medical Center, in state of the art MRI equipment, housed in the Brain Imaging and Analysis Center (BIAC), as well as in electrophysiological probes that could be employed in this work that are in the Center for Cognitive Neuroscience. This seems an area that would readily attract students from a variety of disciplines through a formal graduate certificate program with Ph.D. stipend support from the Graduate School. While a formal graduate program in this area could be developed independently, it might make more sense to make it a component of the broader university-wide graduate program in Neuroscience that is described below.

## Women's Studies

The Program in Women's Studies has been offering an interdisciplinary Certificate Program in Women's Studies to graduate students for a number of years. As now constituted, the Program---with tenure lines---is able to offer students a primary faculty with broad interdisciplinary expertise in the fields of Political Science, Linguistics, American Literature, European History, Ethics and Religion. In 2002, Women's Studies revised its graduate curriculum in order to build a rigorous intellectual and research culture geared to produce graduate students trained in interdisciplinary methodologies of gender and feminist analysis that would, it believed, make them outstanding candidates for positions at top-level research universities.

The strength of the new curriculum has shifted substantially over the past five years and now lies most markedly in its focus on feminist theory and the various critical genealogies in feminist thought, along with its interdisciplinary emphasis and advanced level of inquiry. The major intellectual impulse behind these changes relates to developments in Women's Studies as a field. In the first decades of Women's Studies as an interdisciplinary program at U.S. universities, graduate curricula, where they existed, tended to be the consequence of a kind of "catch all" approach, where courses on women in various disciplines were collated to comprise a multidisciplinary Women's Studies project. This was certainly the case at Duke through the 1990's. As research in the field proliferated in all disciplines and as feminist theory began to have a life distinct from any individual discipline, Women's Studies scholars became concerned with a new set of questions: Is Women's Studies as a field a distinct enterprise of its own? Is interdisciplinarity something more than the summation of discipline based work on women and gender? Are there specific knowledge traditions, critical vocabularies, and methodological presumptions that attach to Women's Studies as a field in its own right?

In order to prepare graduate students to engage with advanced scholarship in Women's Studies as a field, the faculty in Duke's Program created a foundations course to serve as prerequisite to work in the certificate, and required the majority of courses for the graduate certificate to originate in Women's Studies itself. The Program established a set of competencies for those enrolled in doctoral programs that it believed would greatly enhance the intellectual range and depth of the certificate. The revised Ph.D.-level certificate program was designed to help students understand the core knowledge of the field as a discrete academic enterprise, and to link the study of women, genders, sexuality, race, and feminism in the disciplines together.

The Women's Studies Program has, in recent years, undertaken numerous initiatives, including seminars, lecture series, symposia and graduate colloquia, to further this end for its certificate students. In addition, the opportunities available through the Program to permit graduate students interested in this area to engage with the wide community of feminist scholars are truly remarkable. These include the UNC-Duke Annual Lecture in Women's Studies, ongoing collaborations with Barnard College, Harvard's Program on Law and Social Thought, and the Gender Institute at the London School of Economics, as well as co-sponsored conferences throughout the country, which Women's Studies students attend as part of their participation in the core course, Foundations in Feminist Studies. Finally, a Graduate Scholars group sponsored by Women's Studies now gives advanced graduate students a unique opportunity for intellectual engagement with important aspects of feminist scholarship in an interdisciplinary setting. Graduate students participate in symposia as discussion leaders and plan conferences of their own. The Program also provides travel grants to encourage students to attend and present their research at professional conferences.

Given this record, the Graduate School agrees with the Program faculty that it is probably time to consider the next step in Duke's hierarchy of interdisciplinary programs by permitting Women's Studies to admit Ph.D. students directly into the Program itself rather than have to choose a department for their ultimate Ph.D. degree work immediately upon beginning course work at the University. There is, as yet, no strong consensus that the Program should have the ability to grant the Ph.D. itself. But the ability to admit students who are drawn into its rich conversation and array of opportunities at the time of admission could well make Women's Studies at Duke much more visible and able to increase the quality of students attracted to this area of doctoral study at Duke. Obviously, as is the case with all admitting interdisciplinary programs, in the Graduate School, that cannot themselves award the Ph.D., the committee of faculty deciding which applicants can be admitted to the University must have one or more members who believe that their departments would make the commitment to accept and support the student after their initial period of support by the Program (probably one year).

#### African and African-American Studies

Duke has a distinguished group of faculty associated with its African and African-American Studies Program. This faculty, while from diverse fields and theoretical perspectives, emphasizes in its educational programs an interdisciplinary focus on Diaspora Studies and Gender Studies. The Program at Duke is committed to a model in which race is seen as inevitably intertwined with other social hierarchies and one which forces attention to continuities and dis-junctures of social experience across the Diaspora. Graduate students enrolling in the Certificate Program in African and African-American Studies participate in courses, lecture series, and symposia that give them access to a broad range of information and research from the humanities and social sciences, the arts, and the professions on the issues relevant to the AAAS Program. There are T.A.s supported by the Program to help with its undergraduate instruction responsibilities. But the Program, at the graduate level, does not have the visibility within the Graduate School that the quality of its faculty and its programs merit. The Graduate School believes that it is both a challenge and an opportunity for the faculty of the AAAS Program to increase the contribution of this important area to education of students at the doctoral level.

#### Latino(a) and Hispanic Studies

Because this group is one of the fastest growing segments of the American population, it is important that the University develop educational programs and scholarly efforts that will engage the issues raised by this phenomenon. At a university so dedicated and known for its interest and contribution in cultural studies, this seems incongruous, and an opportunity that would be unfortunate, at the least, to miss. Duke is indeed making a serious effort to recruit faculty in this area, and we clearly have student interest at the graduate level. The Graduate School anticipates that in the near future, when sufficient faculty strength is present at Duke, that it will create a graduate certificate program in Latino(a) and Hispanic Studies.

### **BIOLOGICAL SCIENCES**

#### Neuroscience: Brain, Mind, Genes, and Behavior

Duke has made extensive investments over the past two decades in facilities, faculty, and programs designed to make the university and its medical center into a leading participant in one of the most exciting challenges of our time: understanding the cognitive mechanisms that make the human mind function, that give rise to the complex phenomenon that we term consciousness, that lead to various aspects of our behavior, and that underlie malfunctions in cognition and

behavior. In 1988, Duke formed the department of Neurobiology in the Medical School, housed in a new Bryan Research building, and hired a cadre of faculty that is now ranked in the Top 10 in the nation.

In the 1990's, Duke's emphasis on this area expanded dramatically. The Brain Imaging and Analysis Center was formed to provide facilities, including state of the art Magnetic Resonance equipment, to permit Duke investigators to study the physical location in the brain of neuronal activity associated with specific functions and behaviors. The University brought faculty and physical resources into the department of Psychological and Brain Sciences and a new Center for Cognitive Neuroscience with a specific emphasis on investigating the physical basis of cognition and behavior in both humans and animal models. Faculty hired into the Philosophy department made Duke one of the leading universities in the philosophy of cognition as well as adding to its stature in the broader field of Philosophy of Biology. There was significant activity in many other departments as well, including Biomedical Engineering, Computer Science, Psychology: Social and Health Sciences, and Psychiatry and Behavioral Science.

From the point of view of graduate education, there was extensive attention given to this important field in the Ph.D. programs of Psychology and Neurobiology and in a new admitting certificate program for Ph.D. students in Cognitive Neuroscience. But there has been no overall program which could permit Ph.D. students to survey the vast array of approaches that are being taken at Duke to investigate problems in the neuroscience of brain, mind, and behavior. This need for such an interdisciplinary program has been rendered even more pressing by the new possibilities created by the recent discoveries and technological advances in genetics and genomics and the developing interest in the cognitive processes that underlie human decision-making behavior in Economics, Business, Political Science, and other Social Science fields. The new Duke initiative in "Neuro-economics" is but one example of this activity, but there are many others on the horizon.

The Graduate School believes that it is time to create an umbrella interdisciplinary Ph.D. program in Neuroscience to recruit and educate students interested in any of this enormous variety of approaches that pertain to the study of the human brain, mind and behavior. Such a program might initially be formed as an admitting certificate program that would permit students to see the broad set of activities that are available to them at Duke in this area, some common coursework that will provide the basis for their future research, time to choose in which of the many relevant disciplines they would want to pursue further study and dissertation research, and a continuing series of interdisciplinary seminars and workshops that would keep them informed as to advances in knowledge and new approaches to understanding brain function and behavior in disciplines other than their own. In time, this program could well develop into a Ph.D.-granting unit, as have several other interdisciplinary units in the Biological Sciences at Duke.

### Systems Biology

A major thrust in the strategic plan for Arts & Sciences is the concept of Integrating Across Scales in the Natural Sciences. This initiative is based on the realization that the commonly used reductionist approaches to science, which seek to understand the structure and function of individual components of a system (e.g., an enzyme in a metabolic pathway; the hormone insulin in regulation of the level of blood glucose, etc.) are often not sufficient to understand the behavior of large, complex networks of such components, as are typically found in complex processes such as regulation of growth, organ function, population ecology, etc. (The dedication to reductionism has gone so far in the basic biomedical science programs at Duke that we no longer offer a Ph.D. in Human Physiology, a discipline dedicated to the understanding of function

at the level of organs and whole organisms, as opposed to molecules and cells alone.) The Graduate School believes that it is time to consider creation of a Ph.D. program or programs dedicated to education and research in the behavior of organized systems in Biology, and, as a start, we would suggest investigation by the faculty of a new program in the Biology of Complex Cellular Systems. A broader approach, which would incorporate issues involving Evolutionary Biology, Ecology, and Genomics, as well as function at the level of organized cellular systems (i.e., organs and whole organisms), could also be envisioned, although much educational and research activity at the supra-organismal level in biological sciences already exists at Duke.

Such a truly interdisciplinary program is dependent on a type of quantitative perspective that has been missing in the past in most educational programs in the biological sciences and would be heavily dependent on faculty expertise now associated in Mathematics, Computer Science, Statistics, Engineering, the new Computational Biology & Bioinformatics Ph.D. program, as well as in a significant part of the current Biology department. Duke attempted to make a broad effort in this area in the early 1990's by devoting resources to faculty recruitment through the Center for Non-Linear and Complex Systems. The emphasis of this Center, however, has been much more toward the physical sciences and engineering than the biological sciences (although there is some representation by the latter group in the Center). A new program in this area would be, we believe highly attractive to many students who realize that we have entered a "post-reductionist" era in many sciences, and it was also strongly recommended, by a recent team of distinguished external reviewers of one of our most highly regarded biomedical science departments, as a step through which Duke could exercise true national leadership in the scholarly advancement of the biological and biomedical sciences.

#### New Certificate Programs in the Biomedical Sciences

There are a large number of new interdisciplinary Ph.D. programs (not necessarily degree-granting) that have been suggested in the Medicine strategic plan as well as in other School plans. Some of these basically represent re-shaping and expansion of existing programs. One example would be a proposed initiative in Biological Structure and Design (sometimes termed Chemical Biology), which might well subsume existing very small admitting Ph.D. certificate programs in Biological Chemistry and in Structural Biology & Biophysics, and could be expected to reach out to faculty in Biomedical Engineering as well.

A training grant proposal has been submitted to support a proposed new program in Translational Biomedical Research (sometimes termed Molecular Medicine), which is designed to give Ph.D. students in basic medical science disciplines---other than the dual-degree M.D./ Ph.D. students---exposure to courses that provide an understanding of human physiology, anatomy, and disease that is usually only available to beginning medical students, as well as to how clinically-oriented research is conducted in pursuit of new disease treatments, such as drugs. This program might be expected to incorporate training in areas such as pharmaco-genetics that are now being revolutionized by new approaches and findings in genomic science.

New modalities for Ph.D. training have also been proposed in Stem Cell Research and Regenerative Medicine, in Computational Medicine and Biostatistics, in Global Health and Human Welfare, and in Biomedical Ethics. One or more of these may result in a new formal program in the Graduate School (there is, in fact, a proposed new certificate program in Global Health, to be associated with the current certificate in Health Policy, that is about to be considered by the Programs subcommittee of the Executive Committee of the Graduate Faculty) ,but most are more likely to be associated with intellectual thrusts in existing departments and programs.

### Expand the M.D.-Ph.D. program

Duke University had one of the first and most successful programs for creating new medical scientists through education, clinical, and research training that results in awarding of both the M.D. and Ph.D. degrees simultaneously. For their Ph.D. training, the Medical Scientist program students can enroll in any unit of the Graduate School authorized to award that degree. Although the vast majority of such students do their Ph.D. research in basic medical science departments, there are a growing number studying in Biomedical Engineering, and even in fields such as Economics and History. The students who participate in and complete this program are usually among the very best Ph.D. students enrolled in the Graduate School. The program is very expensive---since it provides tuition remission and a stipend for both periods of degree study---and it has been supported, in large part, by training grant awards from the National Institutes of Health, in recognition of the important role that physician scientists play in the medical research activity of the nation, and, as well, by awards from private foundations, such as the Duke Endowment. In spite of this financial support, Duke has one of the smallest Medical Scientist training programs among the leading universities in medical research in the U.S. It is a major priority of both the Medical and the Graduate Schools to significantly enlarge the size of this program.

### Consolidate the Admissions Process in the Biomedical Sciences

There has been a tremendous proliferation of departments and programs which have the ability to admit students to study for the Ph.D. in the biomedical sciences at Duke. There are now more than a dozen such programs, most overlapping in field coverage with one or more other programs, and applicants are frequently confused as to which of these they should enter. What happens, in fact, is that there is a great deal of “horse-trading” that goes on between various departments and programs in order to match applicants with available slots, and, even though each program differs from the others to some extent in required course work, laboratory rotations, etc., students can easily wind up in a program to which they are not best suited in their first year at Duke. (It is easy for a student to change programs, since the Graduate School has worked with the Medical School to make sure that funding support committed by the university to support the student--- always for the first two years, after which the student is supported from research grants--- is attached to the student rather than the department or program in which the student is enrolled.) In spite of this, since each program is assigned “slots” from both institutional and training grant funds, there are a substantial number of excellent students who cannot be admitted with support because of the preferences of individual admitting programs for particular students.

The situation is both confusing to applicants and new students, and can often lead to mis-matches that can negatively impact both the student’s educational experience and the record of the program in obtaining continuation of NIH training grant funding that is targeted to a specific field. Many universities have decided to abandon the practice of admitting most students into individual but closely related biomedical departments and programs and, instead, to admit them into a common admitting program in the Biomedical Sciences. Students are selected by a single admissions committee, with representation from each of the participating departments and programs, with emphasis being on relative student merit as well as the ability of students to find admission and support after their initial year in individual biomedical sub-disciplines. In their first year, students in such programs generally take a core curriculum, with electives to fit their individual interests, rotate through laboratories of their interest, and are supported on institutional funds or on external funds that cover very large categories of interest (such as Duke’s NIH training grant in Cell and Molecular Biology). At the end of the first year, students select a laboratory in which to do their dissertation research, and then are supported on external funds

(usually training grants, where possible) pertinent to their area of research. Students generally take a limited number of specialized courses in the second year and are expected to pass their preliminary examinations no later than the end of their fifth semester of residence.

In such “umbrella” admitting programs students usually transfer after the first year into specific degree-granting units (there are often as many of these as there are at Duke); it is not unusual for such admitting programs to include the non-medical biological science fields as well. In either case, there is a much better match between a given student and the interest for which a given training grant was awarded in this system than in the one currently in operation at Duke, attrition after the first year is not associated with any particular grant or program, and the overall quality of the admitted students seems to be somewhat higher than that at Duke (although this is anecdotal, based on comments of some external review teams).

Although the idea of a consolidated admitting program has been raised before, and was recommended more than 15 years ago by a faculty task force in the biomedical sciences, it has consistently been rejected, largely due to “turf” interests of the existing departments. At the same time, the number of admitting units keeps proliferating in what is, after all, basically one discipline. The Graduate School believes that consolidation of the Biomedical Science Ph.D. admitting units at Duke is an idea that needs to be seriously considered once again. There need not be a single degree-granting unit, or the absence of subfield/departmental interest in the selection of students in such a system, but the current situation---which, in our view, is more confusing than “broken”---certainly could stand reconsideration. Given the need for first year institutional support for nearly all of the students admitted into such an admitting program, the national pressure on the budgets of agencies that make awards of training grants---needed to support the second year for such students, and the fact that non-U.S. citizens or permanent residents are ineligible for NIH training grant support, a new consolidated admitting program in the Biomedical Sciences would not be inexpensive to Duke. It might mean fewer students admitted than is now the case---although it is probable that there would also be less attrition after the first year. The Dean of the Graduate School, in collaboration with the deans of the primary other Schools involved---Medicine and Arts & Sciences---will charge a faculty task force to investigate this matter and recommend, if possible, a better system for admitting students in the Biological and Biomedical Sciences than now exists at Duke.

#### Create a New Ph.D. Program in Coastal Systems Sciences and Policy

This proposal is placed under “Biological Sciences” only because that is the division into which the Ph.D. degree in Environment associated with faculty of the Nicholas School has traditionally been assigned. This placement pre-dates the creation of the Ph.D. degree program in Ecology, which subsumed a significant portion (but by no means all) of the efforts of that faculty interested in phenomena based primarily in biological science disciplines. The remaining Ph.D. in Environment is a catch-all degree, which has the advantages of broad interdisciplinarity, but the deficiency that it covers an extremely broad range of interests that do not overlap very much at the level of doctoral training. Another defect is that the broad term “Environment” does not give prominence to the particular faculty expertise at the Marine Laboratory in Beaufort in Coastal Systems Science and Policy. The strategic plan of the Nicholas School has recommended that the current Ph.D. degree program in Environment be divided into two interdisciplinary components: one, based, at the Durham campus, termed “Environmental Sciences and Policy”, and a second, based at the Marine Lab, termed “Coastal Systems Science and Policy”. The latter degree would involve individual tracks focusing on Coastal Systems per se, and another on Marine Sciences. The latter track would involve some faculty from the Division of Earth and Ocean Sciences as well as those located at the Marine Lab. These degree titles would reflect the still broad scope of

the work in the Nicholas School, but would more accurately reflect the basic objects of study and the faculty divisional structure of the School. The Nicholas School faculty would, if the new program is created, then be strongly associated with four Ph.D. granting programs---Ecology, Earth and Ocean Sciences, Environmental Sciences and Policy, and Coastal Systems Science and Policy---as well as one admitting Ph.D. certificate program, in Integrated Toxicology.

### **PHYSICAL SCIENCES AND ENGINEERING**

Most of the interdisciplinary initiatives in Physical Science and Engineering proposed in the strategic plans for the Pratt School and for Arts & Sciences do not draw a distinct line between these disciplinary areas and the biological sciences. This is only to be expected, given Duke's strength in Medicine and the biological science disciplines, and its long history of effective interdisciplinary graduate training. A number of the thrusts mentioned in the Pratt School plan (e.g., Bioengineering, Photonics, Environmental Engineering) involve potential graduate training that would probably be associated with either existing departments and programs or with some of the potential new programs described above. Two additional areas also fall into this category, but will be described in more detail below because of the broad scope of the activities involved and their potential to broadly impact graduate training in science and engineering across the university.

#### Cellular, Molecular, and Environmental Imaging

One proposed thrust for faculty and programmatic development is in the area of Imaging, conceived in very broad terms to cover the widest possible range of imaging problems short of astronomy. These include: 1) Atomic and molecular structures (at nanometer-level resolution), involving techniques such as x-ray crystallography, solution and solid-state NMR spectroscopy, atomic force microscopy, neutron spectroscopy, etc. 2) Cellular imaging (resolution at 10-100 microns), using various forms of electron and optical microscopy. 3) Molecular imaging of organs and whole organisms (ranging from tens or nm to mm), involving a wide variety of approaches, including free electron laser spectroscopy, magnetic resonance imaging, ultrasound. 4) Biophotonics approaches to biomedical optical imaging. 5) Remote sensing, including global positioning satellite systems and other approaches.

Duke has tremendous strength in some of these areas and significant weakness in others, but this field, broadly conceived, has been and continues to be a target for significant investment in facilities and faculty by Duke across the entire university. There have been key hires in last three years in biophotonics, imaging and sensing technologies, pattern recognition, and chemical biology, as well as many other related areas, that add to traditional faculty strength in areas such as biomedical optics in Biomedical Engineering, Radiology, and Physics, and work on imaging and sensing technology and algorithm development in Electrical and Computer Engineering, Computer Science, and the Nicholas School. Duke has invested heavily in special facilities, such as the Fitzpatrick Center for Engineering, Medicine and Applied Sciences; the Duke Free Electron Laser Laboratory; the Brain Imaging and Analysis Center; the Center for In Vivo Microscopy; to mention just a few, and now stands to benefit by its association with the Oak Ridge National Laboratory's powerful Spallation Neutron Spectroscopy Facility which will come on line in the near future. The new Ph.D. and M.S. programs in Medical Physics can also be considered part of this initiative.

A new Center for Molecular and Biomolecular Imaging would add a great deal to and help to coordinate much of this activity on Duke's campus, and it can be anticipated that there will be graduate program development that will accompany this activity, although, as yet, it is not yet

obvious that what, if any, new formally organized graduate certificate programs will be required in addition to those already in existence (such as the recently created certificate in Photonics).

### Materials, Devices, & Integrated Systems

One of the major thrusts proposed for the university strategic plan is in the area of Materials, Devices, and Integrated Systems. This area represents an integration of “nano-info-bio-opto” approaches to development of materials and devices, and is, in a sense, a marriage of Duke’s biological “soft/wet” materials approach with the development of pertinent inorganic hard/dry materials that can be combined at the nano and micro levels. The research thrusts of this initiative are designed to create new devices that are expected to impact areas as diverse as medical research and clinical practice, environmental monitoring and remediation, computational structures, and communications systems.

This initiative builds on the Center for Biological and Biologically Inspired Materials and its associated admitting Ph.D. certificate program created as a result of “Building on Excellence” in the Pratt School and the recently created Ph.D. certificate program in Nanoscience (which involves faculty in Physics, Computer Science, Chemistry, Engineering, and Medicine), as well as the excellent faculty hiring that has occurred in the Pratt School and in Chemistry, Computer Science, and Physics in recent years. It obviously benefits tremendously from the completion of the CIEMAS facility, and anticipates the planned completion of a Shared Materials Instrumentation Facility in the near future. If properly organized Duke’s activity in this broad field can be complementary and synergistic with great strengths available at North Carolina State University, UNC-Chapel Hill, and the Research Triangle Institute. Although, as currently conceived, this initiative may not require creation of new Ph.D. programs that would be added to those recently created or available at components of existing departmental doctoral offerings, it is clearly an area that will see increasing activity at the level of graduate training at Duke in the next several years.

## **V. Ph.D. COMPLETION**

### ***A. A Study of Ph.D. Completion at Duke***

Over the past decade, Duke University and many other graduate schools have endeavored to increase support for Ph.D. students and, at the same time, reduce the service demands so that they would have the means to complete coursework and dissertation research in a reasonable period of time. As the amount of institutional support per student increased, it became apparent that a substantial fraction was being devoted to students who withdrew before completing their Ph.D. program, and that more needed to be done to significantly improve the completion rate if we were ever to justify the university resources targeted to the graduate program as opposed to other important needs of the university. In order to begin this process, we undertook a study to determine the rates of Ph.D. completion in each of our programs, using entering cohorts which had had sufficient time to complete the degree in all disciplines. Because Duke’s Ph.D. programs are relatively small, we found it necessary to aggregate several years worth of entering classes, and, in the data to be presented, to further aggregate the data into broad disciplinary areas of the Graduate School---the Humanities, Social Sciences, Biological (including Biomedical) Sciences, Physical (including Computational) Sciences, and Engineering.

Ph.D. cohorts matriculating from Fall 1991 through Fall 1995 were examined for each Duke degree granting program for (1) percent Ph.D. completion (as of Fall 2004), (2) time to

withdrawal from the Ph.D. program, and (3) median time to degree. We studied the effect of variables such as undergraduate GPA, GRE scores, race, gender, and merit fellowship selection on each of these parameters.

### **General Findings for the 1991-95 Cohorts**

We found Ph.D. completion rates to be highest in the Biological Sciences (74%), and similar in the Humanities, Social Sciences, Physical Sciences, and Engineering (60-62%). Both the median time to degree (TTD) and time to withdrawal (TTW) were greatest in the Humanities (6.7 and 2.7 years, respectively) and Social Sciences (6.0 and 2.7 years), intermediate in the Biological Sciences (5.7 and 2.3 years), and shortest in the Physical Sciences and Engineering (about 5.0 and 2.1 years). When individual programs were examined, we found little or no correlation between Ph.D., completion rate and time to degree. There was a substantial variation in the patterns of withdrawal in different programs within the same division, with several programs, chiefly in the Humanities and Social Sciences, having median times to withdrawal of 4 to 5 years. It was generally agreed by faculty that attrition after such a long time in the program was to be avoided.

***GPA and GRE.*** (1) When we compared Completion Rates for students entering with High GPA (3.7+) vs. Low GPA (3.2-), we found that the High GPA group had significantly greater completion in the Humanities (65% vs. 54% for the Low GPA group) and Engineering (67% vs. 54%), but not in the Social, Biological, or Physical Sciences. (2) When we compared Completion rates for students entering with High GRE-Verbal (710+) vs. Low GRE-Verbal (590-), we found significantly greater completion only in the Humanities (62% vs. 54%). Curiously, completion was much greater for the Low GRE-Verbal group in both the Social Sciences (64% vs. 54% for the High GRE group) and Biological Sciences (65% vs. 75%). Completion was about 60% for both groups in the Physical Sciences and Engineering. (3) When we compared Completion rates for students with High GRE-Quantitative (710+) vs. Low GRE-Quantitative (590-), we found significantly higher completion only in the Humanities (69% vs. 59%)---an area in which the GRE-Q plays little or no role in the selection of students to be admitted. There were no significant differences in the Social and Biological Sciences, and there were too few students in the Low GRE-Q group in the Physical Sciences and Engineering to make any conclusions.

***James B. Duke Fellows.*** At Duke, each department nominates the best of its Ph.D. applicants for a James B. Duke merit fellowship, which provides a \$4,000 supplement in each of the first four years to anything else that is offered. Committees of faculty from each division of the Graduate School choose what they judge to be the best of the nominated applicants to be offered the J.B. Duke fellowship. (The number of awards is normally about 2% of the total applicant pool.) Since all of these nominees are generally in the High GPA, High GRE group, the faculty must select awardees on the basis of other criteria in the application file (e.g., past research experience, statement of purpose, writing samples, letters of recommendation, etc.). Our data show that in each broad disciplinary field, with the exception, again, of the Social Sciences, the James B. Duke fellows complete at higher rates than the High GPA, High GRE group as a whole. This suggested to us that faculty, by carefully reading and evaluating the entire application, can identify students who are more likely to complete Ph.D. study than others with the same quantitative credentials.

***African-Americans.*** For nearly two decades, Duke has had a program of fellowships (which combine two years free of service with four years of summer support) that are offered to the best minority applicants as selected by a faculty committee from nominations made by departments. Generally, these applications tend to fall in the lower GRE and sometimes lower GPA group, as is the case nationally. Again, the faculty must choose awardees (usually about 40 to 50% of those nominated) it judges to be the most likely to succeed at Ph.D. study based on criteria in the

application other than the quantitative scores. The African-American students who matriculate at Duke also receive a tremendous amount of support from our Office of Graduate Student Affairs and through participation in a number of university-wide student groups. We were pleased to find that these carefully selected and nurtured African-American students completed at significantly higher rates than the general population in all fields other than the Physical Sciences and Engineering (where there were, unfortunately, very few African-American matriculants). In two fields, the Social and Biological Sciences, the African-American students completed at higher rates than even the James B. Duke fellows. The median Time to Degree was not significantly different for African-Americans than the general population in each broad disciplinary group. The Time to Withdrawal, however was much higher for those African Americans than the general population who did not complete in both the Humanities (4.5 vs. 2.7 years) and the Biological Sciences (5.7 vs. 2.3 years).

These results indicated to us that faculty are indeed capable of picking students who are more likely to complete than the general population if only they are required to carefully consider all aspects of the student's application, not just the quantitative scores and grades.

**Gender.** We found significantly higher completion rates for males than females in the Humanities (67% vs. 56%) and Biological Sciences (76% vs. 67%). Both genders completed at about 60% in the Physical Sciences and Engineering. (The results in the Social Sciences are anomalous, in that the completion rate is higher for females (64%) than males (58%), but we believe this result to be an artifact due to the fact that the Social Science discipline with the highest completion rate, Psychology, has the greatest proportion of females, while the one with the lowest completion rate, Economics, is predominately male. Within these disciplines, there is no significant gender difference in completion.)

Although there are clearly discipline-specific effects, for the Graduate School as a whole, there was no significant effect of high vs. low GPA, GRE-V, GRE-Q, race, or gender on the rate of Ph.D. completion. The James B. Duke fellows selected on merit by the faculty, however, completed at significantly greater rates than the general population (73% vs. 64%).

### **B. Changes in Duke's Graduate Programs Introduced in 1995 or Later**

Beginning in 1995, Duke's Graduate School actively worked to introduce changes in departmental and school practices with an eye to improving both the quality of admitted students and the rate of Ph.D. completion. These changes fall into three broad areas:

***Better Informed Selection.*** We urged departments to reduce emphasis on GRE scores and GPAs in selecting students to be admitted and to focus much more on demonstrated research experience. The Graduate School put data on placement, time to degree, and completion rate for each Duke Ph.D. program on the Web, so that students considering studying for the Ph.D. would know what they are getting into. Departments were strongly encouraged to interview students before admitting them, through campus visits, if possible, or by telephone with international students. We asked that applicants and department exchange information during these visits to learn whether or not there would be a good "fit" between student interests and what the program has to offer, rather than just trying to "sell" the program to the student.

***Improved Program.*** We made a strong investment in student services, such as subsidizing child care for Ph.D. students in order to make it possible for them to complete their programs in a timely fashion. We instituted field-specific symposia and workshops to introduce a variety of potential career options to our Ph.D. students. We introduced Graduate School workshops in

pedagogy and uses of instructional technology, expanded our Pathways to the Professoriate program, and required departments to develop career-appropriate structured teaching experiences for their graduate teaching assistants. Finally, we brought together faculty and student representatives to create a “Best Practices” charter of expectations for the faculty, the students, and the Graduate School, which we distribute to and encourage use by each entering class of students.

***Student Funding.*** Perhaps the most significant change, however, was in the area of financial support for graduate students. We instituted a guarantee (in the form of a backstop if good-faith efforts were made to secure external funding where available) of 5 to 6 years of funding for all Ph.D. students in Arts and Sciences disciplines. (Generally support is to the degree in the sciences and engineering.) We greatly reduced student teaching loads (no more than one course or section per semester) and increased the number of years of fellowship support in virtually all programs. We made some type of summer research support available, on a guaranteed or competitive basis, in nearly all disciplines. We funded competitive fellowships to support capstone teaching experiences in which senior Ph.D. students can give courses of their own design to undergraduates.

In order to see that university funds were directed to programs where they could be used most effectively to support quality in graduate education, we began to allocate budgets for Ph.D. student support to departments in Arts & Sciences (and in a somewhat different manner, also in Medicine) based solely on graduate education parameters (e.g., completion rate, student quality as attested by award of competitive merit fellowships, number of faculty chairing dissertation committees) rather than teaching and/or research service needs. At the same time, we made sure to reward departments that obtain external support for graduate students, in fields where this is available, by increasing rather than decreasing the university allocation to them. We began the practice of reviewing and awarding graduate awards budgets for three-year periods to permit departments to buffer variations in yield, and, as an incentive to manage funds wisely, permitted departments to carry over any surplus funds from those budgeted into the next 3-year cycle.

***Effect of Post-1995 Graduate Program Changes on Subsequent Entering Cohorts.***

Because in many fields, there were still a significant number of students entering between Fall 1996 and Fall 1999 who had not yet either withdrawn or completed the Ph.D. program, we focused on the rate of attrition (withdrawal) in the first 5 years rather than full completion. We then compared withdrawal rates in the first 5 years of the Fall 1996-99 vs. Fall 1991-95 cohorts. We found significant reductions in 5-year attrition in those disciplines where the previous teaching service requirements had been greatest. In the Humanities as a whole, the 5-year withdrawal rate was reduced from 25% to 18%. The effect was particularly notable in language and literature departments ,e.g., Romance Studies (from 36% to 23%), German (from 43% to 27%), and English (from 24% to 19%). Although there was little overall effect in the Social, Biological, and Physical Sciences as a whole, 5-year withdrawal was significantly reduced, again, in disciplines where the high teaching service requirements were significantly reduced, e.g., Cultural Anthropology (33% to 7%), Chemistry (34% to 25%), and Mathematics (40% to 32%). In the few disciplines which did not participate in the new pattern of student funding, but instead operated as “tubs on their own bottoms”, the 5-year withdrawal rate , already quite high, did not improve (e.g., Economics, 45% in both cohorts), or actually got worse (e.g., Engineering 36% in the early cohort vs. 43% in the later one). Although we have by no means done a controlled experiment, these results suggest that it is possible to make improvements in graduate programs, particularly with respect to funding and service requirements, that lead to decreased attrition from Ph.D. programs.

### **C. Roundtable Discussions to Develop and Share Best Practices across Disciplines**

Duke's Graduate School has been engaged for several years in an effort to identify and share ideas that might improve Ph.D. completion rates across all of its programs. To this end, the Graduate School, in 2002, distributed published material to all of its programs on issues that might affect Ph.D. attrition; it invited guest speakers to speak to graduate faculty on the subject; and it provided its own ideas as to some factors that may tend to lead to attrition in Duke's own programs.

Our ideas derived in part from the fact that, as we implemented a new financial structure for support of doctoral students at Duke, we had continued to explore anecdotal and provable reasons for student attrition, both generally across the Graduate School and within individual programs. In general, we found that attrition (like time-to-degree) varied considerably by department or program, as well as by broad academic division. In those instances where, for example, an excessively high number of students were being terminated because of their failure to pass a qualifying or a preliminary examination, we had requested the faculty of the program reexamine the didactic coursework that led up to these exams to ensure that it was providing adequate and sufficient training. But we also found, as have national studies that were subsequently published, some very common reasons students themselves cited for dropping out:

- \*incomplete or inadequate understanding of what graduate study was all about,
- \*lack of true intellectual "fit" between student interests and the department focus,
- \*feelings of isolation and lack of appropriate guidance,
- \*inability to find an adequate support structure,
- \*inability to get an honest evaluation of scholarly potentials,
- \*inability to define a clear research project or find a suitable faculty mentor,
- \*inability to see clear career options,
- \*inability to complete research or actually write up research findings.

Working from these factors, we tried, initially at the level of individual programs, to develop mechanisms that could address these problems at the appropriate stage of the graduate student's career. But we felt that the time was ripe to collect and share information that might improve Ph.D. completion across the variety of disciplines that constitute the Graduate School as a whole.

To this end, the Graduate School asked each of its Ph.D. programs to explain and justify its processes for selection, recruitment, orientation, integration, examination, mentoring, and teacher training in the context of how this might affect Ph.D. completion. The department was required to submit its response to these questions prior to its annual budget meeting with the Graduate School, and to be prepared to discuss its responses at that time. (This got the attention of department chairs!).

After collecting these responses, the Graduate School then engaged in dialogue with individual Directors of Graduate Studies and student representatives to identify and refine the best practice ideas, synthesize them together with what has been learned from national studies, and to distribute the results as the basis for a series of dinner roundtable discussions with the DGS's from each broad disciplinary group of the Graduate School. In this way, ideas derived from the Biological Sciences, for example, were shared with DGS's from the Humanities, and vice versa. Finally, the Graduate School published a report, distributed to all of its programs, which outlined best practice ideas from across all of the disciplines. As a result of this process, we got the following response from many faculty: "Now I understand why we should have a Graduate School!"

The Roundtable conversations were incredibly informative. Even though our preliminary analyses of Duke's completion data had shown that there was little or no correlation between GRE or GPA scores of matriculants and ultimate completion rates in most disciplines, we discovered that, while almost all programs stated that they were more interested in the intellectual "fit" of applicants than GRE or GPA scores, a significant number of departments had not considered how they might really discover that "fit." Special strategies had been adopted by several departments for interviewing international students by telephone and many programs had adopted the model of bringing top applicants to campus before making final admissions decisions. We also found that while many departments brought students to campus for interviews, many did so after admitting the students and the visit was more of a "sell" of the program than an honest attempt to see whether there was actually a good fit between the program and the student.

Although most of our graduate programs held some sort of orientation program for entering students, we discovered wide variation in the richness of these programs and therefore in their effectiveness in truly introducing students to the expectations and opportunities of the program and its faculty.

Overall, we found the strategies for integrating students immediately into the research focus of the program were probably stronger and more carefully developed in the physical and biological sciences than they were in the humanities and the social sciences. Despite central Graduate School efforts at initiating a variety of "professionalization" seminars and workshops, individual programs had not devoted significant attention to these kinds of opportunities.

In terms of our examination structures, we were pleased to discover that the time-lag between formal preliminary examinations and a formal or informal submission of a dissertation project proposal had, at our prodding, narrowed to 6 months in all but a few departments. This was a significant improvement from practices 10 years ago, when students, particularly in the humanities and social science, might go as long as two years after the preliminary exam before actually settling on a clearly-articulated research progress. Finally, we discovered wide variation in the capacity of programs to systematically track the progress of their students in the later, dissertation years. As a result, the Graduate School soon implemented a new policy requiring all Ph.D. students to file with their programs an annual Progress towards Degree report.

Some of the specific Roundtable inputs were as follows, and the Graduate School has been working since 2002 to introduce many of them into multiple departments:

- Institute comprehensive orientation programs by the department and/or the Graduate School to introduce program faculty, the history and major issues of the field, methodology of the field, possible career options, and opportunities to improve skills to take advantage of those options.
- Distribute and discuss clear program guidelines and expectations with new students, with milestone achievement markers.
- Make sure that there is an interested first year advisor or, better, multiple advisors for each student; often, a senior graduate student "buddy" is assigned to new students.
- Strongly encourage freedom of mentor choice, with rotations if possible; try to get as much first year funding as possible free of mentor and of service.
- Encourage first or second year research projects that are to be completed as a group collaborative effort.
- Clarify faculty expectations for qualifying and preliminary examinations; hold all students to the same standard.

---Ensure that there is a meeting or examination to consider the prospectus for the dissertation research project no later than six months after passing the preliminary exam.

---Graduate School should publicize examples of excellence in faculty mentoring of Ph.D. students and give annual awards and public honors to the best faculty mentors as selected by students.

---Require bi- or annual reports to the Director of Graduate Studies and the students committee on the student's progress toward completing the dissertation, whether or not that student is still on campus, so that "no student gets lost".

#### **D. Improving Ph.D. Completion—A Work in Progress**

Although we believe that it is possible to improve the current rates of Ph.D. completion in many programs through interventions such as those described above, it will probably never be possible to perfectly select students who will successfully complete with the Ph.D. in a particular unit or school. Although the new types of GRE General Test exams that Dean Siegel, as Chair of the Research Committee of the Graduate Records Examination Board, has been working to construct will be introduced in Fall 2007 might be better (we hope!) for selecting Ph.D. students who can complete the degree program than the current ones, it is clear that there are many non-cognitive factors, such as motivation, persistence, etc., that play an important part in determining the outcome of Ph.D. study. Yet our data show that faculty, when they carefully consider the entire application--not just discard or approve applications based on test scores or grades--can identify students more likely to complete than others. We also know that some tests that *could* be used more effectively in selecting Ph.D. students who can complete, e.g., the GRE Subject tests, are not utilized at all in many programs.

We believe that it is axiomatic that transparency can only help matters. Students need as much honest information as possible to decide whether or not the long and challenging road to a Ph.D., with, in some cases, an uncertain type of career outcome, is right for them. Both faculty and student need to determine whether the "fit" between student and the department, with respect to faculty interest, program of study, and cultural environment, is right; and if it is not, then the student, on visiting, should be directed to other universities that might be more suitable for them.

Finally, there is general agreement that, given the large financial investment that a university such as Duke usually makes in each new Ph.D. matriculant, it is important that students be selected who have the best likelihood of completing the Ph.D. program with a high quality dissertation. However, given the large number of factors that come into play during the long road to a Ph.D., some attrition is inevitable. What, then, is an "acceptable" level of completion? Also, when we introduce what we hope are improvements in our graduate programs, how, given the long time it takes to get a Ph.D., will we be able to determine that any such "improvement" is actually having an effect? These are difficult, perhaps impossible, questions to answer, but Duke had begun the work to dissect the problem of Ph.D. attrition---now it was time to join with others to collect national data and to experiment with possible solutions.

#### **E. The National Ph.D. Completion Project**

Duke, through Dean Siegel presented the results of its work on Ph.D. Completion at national meetings of graduate deans and used its participation in the national Responsive Ph.D. Initiative sponsored by the Woodrow Wilson Foundation as a mechanism to emphasize the need for real data at the national level in order to devise better strategies to deal with the problem of high rates of attrition from Ph.D. programs. (The Woodrow Wilson Foundation provided the funding for the Roundtables project at Duke in 2002.) The Sloan Foundation and the Council of Graduate

Schools (the umbrella organization for Graduate Schools in the United States) co-sponsored a workshop in Airlie, Virginia, to share what information had been collected by Duke and others (mostly through surveys of students) on the subject. And finally, with the strong support of its governing Board, composed of graduate deans elected by their colleagues from the 450 member universities across the U.S. and Canada, and during Dean Siegel's two year term as its Chair, the Council of Graduate Schools (CGS)---using what Duke had already done as a model---established a program of grants to create, implement and pilot intervention strategies and to evaluate the effect of these strategies upon doctoral degree attrition patterns and completion rates at American universities.

This project is designed to collect an internally consistent set of data at the national level that will inform us as to what actually is the rate of Ph.D. completion in different disciplines, in different types of universities, in large vs. small programs, and in different groups sorted according to gender, minority, international, etc. The project also will examine the patterns of withdrawal from Ph.D. programs and will, for the first time, attempt to examine how much "attrition" actually represents transfer from one university to another and subsequent completion of the second degree program. In addition to developing a sorely needed set of data on which to base possible interventions, the project aims to ultimately increase Ph.D. completion by uncovering and seeding practical models that can be promulgated as best practice for implementation by graduate schools nationwide, including strategies to improve Ph.D. completion for minorities and women and recommendations for implementing these strategies. The project is supported by Pfizer Inc to include Science, Engineering, and Mathematics (SEM) fields; the Ford Foundation has provided additional funding to include the social sciences and humanities. Duke was one of first 15 universities in the nation selected to receive one of these grants. As part of its participation in this important project, Duke's Graduate School has agreed to:

- Administer an exit survey questionnaire, to all doctoral degree recipients and to those who leave their doctoral degree program, that will include common questions for all project institutions, summarize the data in annual project reports, and share the results with department/program faculty and chairs.
- Collect data on entering cohorts of students by field, race/ethnicity, citizenship/residency, and gender, and submit this institutional data to CGS for presentation of collective results on a CGS website, both during the grant period and, preferably, for an equal period afterward, in order to determine longer-term outcomes.
- Develop an institutionally consistent policy on how we will track and report students who stop out or transfer to other programs or institutions.
- Address how we will identify, track, and report on those students who enter as master's degree students and then enter Ph.D. programs;
- Create transparency for prospective students by publishing data on Ph.D. completion and other issues by program on our institutional and program websites;
- Implement, or report on the results of previous implementation, that the institution believes could contribute to a potential increase in Ph.D. completion rates and that fall within the categories of improved selection processes; mentoring; financial support; processes and procedures; program environment; and research mode of field.

- Conduct ongoing project assessment of the proposed interventions at the program/department level as well as at the graduate school level
- Report semi-annually to CGS on the outcomes of the ongoing evaluations via written reports and presentations at CGS annual meetings and/or summer workshops
- Highlight our participation in this national effort by: taking the lead in national discussions on the topic of Ph.D. completion; sponsoring events to raise the visibility of the completion issue; fostering dialogue across programs, disciplines, and fields; and convening groups of students and faculty to discuss the issue.

This is quite an assignment for the Graduate School over the next few years, but Duke was, in fact selected because it had been dealing with this issue---and had real data and significant program changes in place---before almost every other university in the nation. In order to understand what we believed our unique role might be in this national effort, it might be useful at this point to quote from Duke's formal application for participation in the CGS Ph.D. Completion Project:

We have spent 10+ years categorizing and analyzing matters of graduate student completion rates and adjusting our programs in strategic ways to enhance these rates in each of our programs. We have not been idealistic or naïve: we recognize that some graduate student attrition is inevitable. But our aim has been to minimize, as far as we can, the factors that increase unnecessary early attrition, and to cut out entirely those that contribute to attrition late in a graduate student's career. We have felt from the start especially concerned about this latter category and have tried hard to minimize the waste of time, effort and financial and personal resources such attrition takes not only on the graduate students themselves but the institution as a whole.

And, most importantly, we have tracked the effects of these changes over time for the last decade. We believe that this is a particular and perhaps unique offering that we bring to the CGS project. We have not only been a vocal national champion of paying more attention to the issue of overall graduate student completion rates, but we have been in the forefront of institutions willing to share comprehensive and longitudinal data on our individual programs and collectively on the Graduate School itself. We have promoted in various forums the need for graduate schools to publish this data so that prospective students have a reasonable understanding of the realities of graduate education and we have urged that graduate schools themselves need to analyze this data for the education of their own faculties and administrations. We believe that our combination of strategic programmatic innovations and detailed longitudinal data provides a rich repository of provable "best practices" for enhancing the completion rates of graduate students nationally.

As we have outlined above, Duke has already developed and implemented a number of strategies with the aim of increasing overall graduate student completion rates. Our specific goals for the Ph.D. Project itself encompass several additional steps.

First, we are focusing particular attention on 10 existing departments selectively drawn from each of the broad academic divisions of the school: from the Humanities, English and Romance Studies; from the Social Sciences, Economics and History; from the Biological and Physical Sciences (including Engineering), Biology, Biomedical Engineering, Chemistry, Computer Science, Electrical and Computer Engineering and Mathematics. These departments were selected not only because, for us, they are reasonably large departments

and therefore ones with a sufficient history to make the tracking of completion rates statistically significant, but also because they represent relative extremes of our stages of attrition. That is, these departments represent the broad trajectories of attrition at Duke: Economics and Mathematics, for instance, are examples where attrition has occurred quite early in the graduate programs; History and English are programs that have exhibited substantial peaks of late-career attrition.

Four of these departments have been participants in the national Carnegie Initiative on the Doctorate---a project to improve doctoral education at the disciplinary level---and have therefore already begun implementation of some new strategic initiatives directed at improving completion rates and at better and faster integrating of new students into the research culture of the department or program. Chemistry has been experimenting with an entirely new first-year curriculum for entering doctoral students, a curriculum making greater use than heretofore of laboratory rotations and comprehensive coursework; Mathematics has also introduced a new core disciplinary seminar and is further institutionalizing structures it developed during its recent VIGRE grant; English is streamlining a very successful model of Teaching Apprenticeships and also developing a new core course on the History/Future of the Discipline; and History has been developing a more comprehensive inter-disciplinary curriculum to emphasize the ways the discipline has increasingly made intellectual linkages to a number of more professional fields, like Public Policy, Medicine and Law.

Each of the ten departments, moreover, has recently undergone a significant re-envisioning of its graduate program, whether as a consequence of Duke's system of external reviews, prodding from the Graduate School, or as a reconsideration of some of the implications/possibilities of the Roundtable report. We believe, therefore, that they are both useful programs to provide an historical sense of attrition over the last decade at Duke and to offer a seedbed for new initiatives, even though we will continue to collect data on all graduate programs and even though we may, with CGS approval, substitute or add to these departments during the implementation phase of the project.

Second, we plan to use our existing longitudinal database to conduct a fuller study of graduate student attrition/completion rates since the basic program of structural change was fully implemented in 1995-6. Because of the richness of our data, much of which goes back to cohorts entering as early as 1986, we have already been able to derive preliminary conclusions of the effectiveness of certain programmatic interventions, but we very much need to supplement that work with a more comprehensive study of cohort groups. We believe that we have sufficient data to extend the range of this study from 1991-92 through the present academic year. While it is unclear how aggregating distinct "cohorts" might reflect historical changes in completion rates within individual departments/programs or within broad academic divisions, we believe that we can provide important longitudinal data to explore this issue.

Third, we have developed an exit survey instrument for those students who do not complete the Ph.D. degree. We have historically tracked reasons for student attrition for many years, but the sources of our information are informal, often unreliable, and certainly not comprehensive. Since we have streamlined now the general process of electronically surveying all completing Ph.D. students, we believe the addition of a second and complementary instrument for non-completing students will give us, and CGS, a more detailed look at students' experiences in Graduate School. We are prepared, as with all other of our collections of graduate data, to share this information with the broader graduate school community.

Fourth, as already indicated, Duke University has, with its 2002-03 Roundtable Report, taken a significant institutional step toward moving beyond the identification of those issues affecting graduate student completion to promoting practices that can address those issues and increase the likelihood of overall completion. We would like, as a Graduate School, to see our overall completion rates come closer to 75% than to their current 63%, and we recognize that in order to accomplish this goal we will need to institutionalize identifiable “best practices” more broadly. We believe that it will be important, therefore, to hold a new series of extended Roundtable discussions on a regular basis over the next few years. These discussions should be focused on specific topics that seem likely---based on our data and on information derived from our participation in the CGS Completion Project---to affect completion rather than the broad sweep of issues covered in the 2002 discussions.

We believe that with a minimum of Graduate School organization and support we can extend many of the best practices we find in internal units (or import from outside the university) across current disciplinary and divisional lines. There is clearly much that discrete areas of the School can learn from other areas and we believe it is our responsibility to promote that process. As but one example, we believe that the faculty-student models of regular and periodic discussion groups, journal clubs, and colloquia used in many of our biological science programs would benefit the humanities and the social sciences. Currently, such combined faculty/graduate student discussions are often limited to specific thematic interdisciplinary foci (such as Feminism, Transnational and the International; Atlantic Ocean Studies; Latin American and Caribbean Studies; University Seminar on Human Rights/Civil Rights) that are being underwritten by various Centers within the University. There is no reason why this model cannot be extended to individual graduate degree programs.

As should be evident, our work in the area of trying to increase Ph.D. completion has much broader implications for the way we conduct graduate education and communicate with each other within the graduate community than the name “Ph.D. Completion Project” might suggest. Duke has been a leader in this national effort to improve doctoral education through basing decisions on the collection, publication, analysis, and discussion of real data. Many graduate schools throughout the country now look to Duke and expect from us this type of leadership. We must not let them down.

## **VI. FINANCIAL SUPPORT FOR GRADUATE STUDENTS**

### ***A. Goal: To bring the packages of financial support for Ph.D. students to competitive levels.***

#### **Background and a History**

##### **The Princeton vs., Yale Models for Support of Ph.D. Students**

The Graduate School plan submitted in 1992 stated that a primary goal for the Graduate School should be to ensure that Duke could compete on a level playing field, with respect to the financial support it could offer, for excellent Ph.D. students with the top group of private research universities in all disciplines. At that time, the data collected by the Graduate School showed that the stipends offered to entering Ph.D. students in both the humanities/social sciences and in the sciences and engineering were at or near the bottom in the list of its peer universities. Most departments did not offer more than one or two years of guaranteed support to admitted students, there were relatively few fellowships, and most of the support was tied to heavy amounts of teaching, particularly in areas of language and writing instruction. The data also showed that

whenever increased amounts of money for graduate student support were awarded to departments, there was a strong tendency, particularly in the humanities and social sciences, to use that increase to bring in larger entering classes of Ph.D. students rather than, as in the sciences, to raise the stipend levels of the students. The Graduate School put forward to the Executive Committee of the Graduate School two contrasting models with respect to graduate student support as exemplified by two institutions, each of which had achieved excellence in its Ph.D. programs to which Duke could (and did) aspire.

One model, used by Yale, was similar to that employed at Duke in the late 1980's and early 1990's: Use whatever financial resources available to bring in a high ratio of graduate students per faculty member (generally 3.0 or more), and put together packages on an ad-hoc basis, department by department, which led to highly variable stipend levels even for students in the same department, and high levels of service requirements in many disciplines. Because of its reputation as a university and the undoubted excellence of its faculty in most disciplines, Yale was able to maintain a large body of students of high quality with this model. (As we saw subsequently, this model, and its underlying mindset, also led to high levels of student unrest and the development of a strong drive for unionization of the graduate students, which, in turn led to an atmosphere of contention and distrust between students, faculty, and administrators at Yale which persists, at some level, to this day.)

A second model, used by Princeton, utilized a rich set of financial resources to support a relatively small population of graduate students, with student/faculty ratios roughly half that at Yale or at Duke in most disciplines. The students at Princeton were provided with stipends much larger than those at Yale, there were many more fellowships as opposed to teaching assistantships, and packages offered to admitted students usually covered multiple years of guaranteed support. The overall amount of funding available to support students at Yale and Princeton was similar, and in each case was considerably larger than that available to support graduate students at Duke. At Duke, we were in the awkward situation of trying to support the large student/faculty ratio of Yale, rather than the smaller one at Princeton, but without the resources of either of the model institutions.

The 1992 plan, of course, called for more support for graduate students by the Duke administration. And with the development of a specific targeted revenue source for the Graduate School, termed the "registration fee", which was to be used exclusively for the support of graduate students and their programs within a new financial formula for the Graduate School, such increased financial support was eventually forthcoming. The Graduate School also got the deans of the other schools to agree that, although the "tuition" revenue derived from graduate students was to be credited to the schools in which the faculty had their primary appointments, little or no part of that revenue (most of which was actually in the form of scholarships, or in effect, tuition scholarships, in the case of Ph.D. students), would be used for any purpose other than for the direct support of graduate students and their immediate programs. This was a remarkable and generous commitment by these schools, a commitment which is rare at most universities and which spoke to the desire of those schools to work with the Graduate School to achieve as high a level of excellence in their graduate programs as possible.

#### The 1992 Graduate School Plan: the ECGF Sets a New Goal

The Executive Committee of the Graduate Faculty, after reviewing the data and much deliberation, made the fateful statement of policy that it was Duke's goal, above everything else, to have the best graduate students that could be attracted to Duke to work with our faculty. This meant that the resources available to support those students must be concentrated in such a

fashion as to enable Duke to compete with its peer institutions for those students on a level playing field with respect to student support---i.e., admitted students should accept or decline offers from Duke based solely on considerations of the quality of Duke's faculty and its programs and the fit between their own interests and those of the faculty. Given the limited resources available to support graduate programs at Duke as compared to its much more richly endowed competitors, this led to one conclusion: that Duke must operate much more on the Princeton than the Yale model---i.e., any increases in financial resources available to support graduate students at Duke should be targeted toward improving the amount and the quality of the financial packages Duke could offer to attract the best students to accept its offers, rather than be used to increase the size of the graduate student population.

There was also an important element of simple fairness, as well, in that, at the time of the 1992 Plan, Duke Ph.D. stipends, particularly in the humanities and some of the social science disciplines, were substantially below the cost of living for Duke students as published annually in the Duke Bulletin. This meant that many students had to take on extra jobs at the University and elsewhere---as well as loans---to continue in Graduate School, and that they therefore simply did not have sufficient time to be students, rather than service providers to the institution. (Although we did not realize it at the time, the attrition rate for Ph.D. students at Duke was significantly higher than it would later prove to be when we were eventually able to substantially increase our packages of financial support and, perhaps equally importantly, reduce the requirements for service to obtain that support.)

#### 1993: An Agreement with Arts and Sciences

By the time of the 1994 Update to the previous Graduate School plan, there had been significant progress toward increasing the stipend levels and decreasing the service requirements for Ph.D. students in many, but certainly not all, Duke graduate programs. The Graduate School had directed its Graduate Awards budget allocations to those programs which would guarantee competitive stipend levels to all incoming students and agreed to target support to current students through at least the fourth year. Importantly, the deans of Arts and Sciences and the Graduate School had reached an agreement that the budgets for Graduate Awards and for teaching assistantships given to departments should be used, in effect, as a single pool of dollars, with the total amount calculated primarily on the basis of the number of high quality Ph.D. students that a department could attract and the need for a minimum average number of years of support for each such student at a competitive stipend level, as determined by the Graduate School (which would take into account the availability of external fellowship and grant support for students in that discipline), rather than the simple number of teaching assistants requested by the department, as had previously been the case.

Departments were to be allocated budgets to support a certain population of Ph.D. students, with the allocation being equivalent to a certain number of Ph.D. student "FTE", each of which was to be supported with a defined minimum stipend and all required fees and tuition charges. In humanities departments, with relatively limited access to external sources of support for graduate students, the number of FTE was expected to equal a large proportion of the total number of students in the years of guaranteed support (generally three or four in those years). In the sciences, in which students could generally be supported for a substantial number of their years at Duke as research assistants paid from external grants, the total population of Ph.D. students was expected to substantially exceed the number of FTE provided for institutional support of a department's students.

As part of the agreement, the Graduate School committed to use its resources to guarantee a “bottom line” for support of Arts and Sciences Ph.D. students, thus assuming the risk if tuition and fee revenues were not sufficient in a given year to support the needs of the graduate programs in A&S in a given year. (Since that time, the Graduate School has absorbed substantial swings in the net expenses associated with the A&S graduate programs---in some years, the Graduate School has subsidized those programs by more than \$1 million, in others, it has been able to put into its reserves several hundreds of thousands of dollars derived from those programs. Over the 12 years that the agreement has been in effect, the net balance associated with these programs has been about zero.)

#### The 1994 Graduate School Plan: Downsizing of Arts and Sciences Ph.D. Programs

By 1994, it was clear that the dollars available to support the Ph.D. programs in Arts and Sciences at competitive stipend levels, with students support back-stopped for 5 full years (as was strongly requested by the chairs of the humanities and social science departments), would not be sufficient if the population of Ph.D. students were not substantially reduced in those disciplines which relied primarily on institutional support for students. Thus began a period of substantial downsizing of the entering classes and the resulting student populations in the humanities and social sciences at Duke. This reduction in Ph.D. student populations extended to some of the most highly ranked graduate programs at Duke---e.g., the Ph.D. enrollments in English and Religion were cut nearly in half over the next five years. The budgets for student support allocated to those departments were not decreased, but were in fact substantially increased as new resources were developed by the Graduate School.

In contrast, the Graduate Awards/ T.A. budgets allocated to departments with substantial access to external sources of support, mostly in the natural sciences, were increased, but at a rate much less than the rate of increase in the level of stipends required to support students, so that those departments had to increase the proportion of students supported on external rather than institutional funds if they were not to suffer substantial reduction in the size of their Ph.D. programs. After a brief period in which the natural science departments did indeed contract (associated more with a period of tightening of federal support for sponsored research than with anything else), they did substantially increase the amount of external support for students, and they have since increased in student population to substantially more than the mid-1990’s levels.

By the time of the Year 2000 Graduate School plan, it appeared that the Graduate School, through downsizing of some programs and increases in the amount of institutional and external funds available to support students, had effectively reached its 1994 goal of providing adequate and competitive support for its Ph.D. students through the 5<sup>th</sup>, and even in some cases, the 6<sup>th</sup> year. The policy of the Graduate School of restricting the number of hours of non-dissertation related service that could be required of its Ph.D. students in return for financial support to 19.9 hours or less per week, and to permit teaching assignments of no more than one per semester, with at least one year of non-service related support, had been virtually uniformly accepted. The sharp decline in the number of applications for Ph.D. and research Masters programs that accompanied the economic boom of the mid and late 1990’s, seen nationally as well as at Duke, had made a decline in the Ph.D. population of many programs inevitable---if not painless---if faculty were to maintain a high level of selectivity in admitting students to their graduate programs. The match between financial resources and the student populations that could be adequately supported with those resources seemed relatively secure.

### Goals of the 2000 Graduate School Plan

Although faculty in some disciplines still called for large increases in the size of their graduate programs, usually in the name of the need to recruit more research-oriented faculty, the Graduate School, in its 2000 Plan, felt that it could devote more of its attention to other goals associated with support of graduate students. Many of these goals were directed at enhancing the services that would be available to help graduate students become better teachers, to increase their career options in a tight market for academic jobs, to improve mentoring, to increase diversity, etc. But many were associated with increasing amount and the quality of the financial support that Duke could offer to its Ph.D. students both to increase the competitiveness of our offers to admitted students and to decrease the rate of attrition and the long times to degree for the students already in our Ph.D. programs.

Thus the 2000 Plan called for a program of university-funded summer research support in those disciplines where external funding is not normally available (i.e., the humanities and social sciences) in order to enable students to reduce the interruption in their dissertation research and/or writing caused by the need to find jobs to meet their living expenses after the end of the academic year. In a similar vein, the Plan called for an increased number of dissertation fellowships to enable students in those disciplines where the time to Ph.D. degree is normally seven years or longer to graduate both in a reduced time and at a higher rate of completion. The Graduate School also sought to increase the number of years of fellowship, rather than teaching or research assistantship, support for Ph.D. students in order to give them more time to work on their studies and research, and thus reduce the trend to increasing times to degree in most disciplines. This program was felt to be of particular importance to attract students into programs in the sciences and engineering, where it had become the norm in many disciplines to give students the freedom to rotate through different laboratories in order to find the most suitable mentor for their dissertation research.

None of these ideas were unique to Duke. They were being introduced by a number of our peer institutions in order to attract students, as the decreased number of applicants had, by the end of the 1990's, markedly increased the competition among the elite private universities for the best of the year's applicant pool. Duke's Graduate School had started pilot programs in some of these areas, but it clearly did not have the resources to sustain them without going into deficit. We have made significant progress toward accomplishing many of the 2000 Plan goals described in the preceding paragraph, but events that have occurred since that Plan was submitted have made the need to address the level of support packages we must offer to compete for top quality Ph.D. students become much more acute than it seemed to be at that time.

### The Ratchet Effect on Ph.D. Student Support Packages

At the beginning of this decade, Princeton, like many highly endowed universities at that time, found that the dramatic increase in its endowment income associated with the boom of the 1990's necessitated a revision to its rather conservative policy on spending endowment income. Suffice it to say, the policy at many universities, and at Duke as well, is to set a basic percentage of the endowment that can be spent by the University in a given year, and then to place a limit the actual dollar increase in spending that can occur in any year in order to avoid the problems that would be associated with dramatic fluctuations in income in any given year. In a period of rapidly rising investment returns, this "cap" on spending can lead to a situation in which the actual amount of endowment income falls for a substantial period of time markedly below the target spending level originally set. In such cases, the Board of Trustees sometimes makes a decision to increase the amount of endowment spending substantially in a given year, in order to bring it more in line with

the target rate. When that happens, the administration of the University has the option of distributing a sudden windfall to all constituencies, or targeting some or all of the new increment in continuing endowment income to one or more specific purposes which the university finds particularly important at the time. At Princeton, President Harold Shapiro successfully argued to the Board that the substantial increment in endowment spending, which it had just decided to authorize, should be devoted entirely to improving the financial aid given to both undergraduate and graduate students. He made the remarkable (to us) decision that half of this money would be used to increase the packages of financial support offered to graduate students at Princeton.

Thus Princeton dramatically increased the stipends offered in its graduate fellowships to levels that were much greater than those offered by any of its competitor universities. The number of fellowships was substantially increased, and the number of service-related assistantships decreased. A program of multi-year summer research support was instituted for all Ph.D. students. These competitive pressures inaugurated by the Princeton decision immediately caused a ratchet effect on stipend levels, causing all institutions with sufficient access to funds to scramble to raise stipends at rates far exceeding inflation. While Duke was increasing its stipend levels to be at the median of its private competitor institutions, that level was increasing dramatically each year.

The practice of giving either guaranteed or competitive summer support to students in areas where external funding is not available was instituted at most of Duke's competitors, as was the provision of health insurance as an addition to (not part of) the basic stipend payment. The practice of giving James B. Duke fellowship-type "bonus" awards to applicants judged to be most meritorious by the institution, originally limited to Duke and a very few other institutions, became relatively common. Duke's relatively unusual commitment to backstop funding for Ph.D. students in all fields for a minimum of 5 years was matched by most of its competitors, and, in at least one instance, this guarantee was extended to attainment of the degree in all fields.

Prior to the events at Princeton, Stanford's President had already made the decision to raise an endowment of \$200 million to create a program of endowed fellowships, in order to reduce the heavy support of that university's graduate programs on external research support---which had recently undergone a period of dramatic fluctuation that threatened the stability of some of its highly regarded programs. This program, together with that at Princeton, caused the idea that institutional support, in the form of fellowships as opposed to assistantships, should be available to science and engineering, as well as humanities and social science, programs to become much more prevalent at private universities. The idea that there should be more fellowships which were portable for science students, not tying them immediately to a given laboratory or research project---while not new at all in the biomedical sciences---now began to expand to other scientific disciplines and to engineering.

Just as institutions were trying to find resources to meet the costs of these expanded fellowship programs, a dramatic increase in stipends in science and engineering fields was triggered by a decision by the National Science Foundation---in an attempt to expand the pool of top quality students who would seek Ph.D. training in those disciplines---to increase the stipends for its highly competitive and prestigious pre-doctoral fellowships from \$15,000 (where it had languished for a number of years until the stipends actually paid to most students at many universities actually exceeded this amount) to \$30,000 all at once. The new NSF level was more than 50% greater than the amount normally paid as stipends at private universities at that time. The stipends of a number of other national fellowship programs, such as the IGERT traineeships and the Javits fellowships, were also raised to the \$30,000 level. At the same time, the educational allowance paid by these awards to universities (in lieu of tuition and fee payment) of

\$10,500 was not raised. This was important, because this type of revenue is often used by universities, such as Duke, to create fellowship stipends for other Ph.D. students, and the limitation of this allowance at the same time stipends were rapidly increasing was a harsh blow to the universities that could attract these highly meritorious students and programs. While the stipend itself was dramatically increased by NSF, there was no provision that health insurance or other benefits be paid to these awardees, and the growing tendency to provide this type of stipend supplement proved an additional drain on the limited educational allowance in NSF-related fellowships and training programs.

NIH, in recognition of the now large gap between the stipend levels for students supported on its National Research Service Award training grants and the new NSF level, and in a period of doubling of the NIH budget, also initiated a series of above-inflationary stipend increases that had to be matched for other students (on fellowships or assistantships) in the same field by universities. More recently, as it was facing much heavier budget constraints, NIH markedly slowed the growth of stipend levels on its NRSA training grants, so that many universities, faced with the ratchet effect on stipends initiated by the NSF fellowship increase, now needed to actually supplement the stipend levels on these NIH training grants to meet the competition.

#### A Limit on Educational Allowances for Students Supported on NIH Training and Research Grants

Much of the revenue that could be used by universities to help fund the increased institutional support of Ph.D. stipends has traditionally been derived from tuition and fees paid on behalf of the student supported on training or research grants. In some cases the amount of such payment to the university is at a fixed level, as in the NSF fellowships; in others varying fractions of the tuition/fee sticker price at the university can be charged to grants. In the case of NIH training grants, the amount that could be paid to the institution was up to 60% of the university's tuition/fee charge. (This is the primary reason that Duke chose to dramatically raise its tuition for Ph.D. students, even though relatively few actually pay the tuition themselves.)

In the case of research grants, the tuition amount was not usually subject to such fixed limits, and in some disciplines, such as engineering, many contracts paid 50% or more of the tuition charged to the university. However, faced with a constrained budget and rapidly rising tuition charges at universities, NIH began to limit the total amount that could be paid as compensation to graduate students (whether as stipend, tuition/fees, or anything else) serving as research assistants on NIH research grants. This NIH "cap", which sets the total compensation to a graduate student at no more than the stipend level set by NIH for a first year postdoctoral fellow, severely limits the amount of tuition/fee revenue that a university can obtain from a student supported from an NIH research grant if the stipend (plus health insurance) paid to that student from the grant is set at nationally competitive levels. Since the "cap" has not been raised as rapidly as stipends have increased, there is, in fact a tendency each year to reduce the amount of tuition/fee revenue that an institution can obtain from NIH grants, revenue which, at Duke, is entirely used to create fellowship dollars for other graduate students.

Within the past six months, NIH, in an effort to further conserve resources, has frozen both the stipends (which now are actually below the levels paid to students in the biomedical sciences at many top private universities) and the dollar amount of tuition/fees that can be paid for a student on any of its training grants. There is now a proposal, which is very likely to be implemented, that will limit the total amount of stipend, insurance, and tuition that can be paid to Ph.D. students on NIH training grants, probably to something like the level of the NIH research grant "cap". In addition, and perhaps more importantly, NIH has been reducing the number of students that can

be supported in many of its training awards to universities. Taken together, these events have placed severe pressures on research universities, including Duke, to meet the increasing levels of stipends and benefits that are offered to attract Ph.D. students at many of its much more highly endowed competitor institutions.

### **How Competitive are the 2006-07 Duke Financial Award Packages for Ph.D. Students?**

Each year, the Graduate School asks those students who had received and declined an offer from Duke to answer a series of questions as to 1) what university (if any) they actually attended, 2) what were their most important reasons for declining Duke's offer, 3) how did the amount and duration of stipend support compare to that offered by the institution they decided to attend, and 4) whether service was required as part of their offer from Duke and the institution they attended. The response rate to these questions for the four years from 2002 to 2005 has averaged 55%.

As we hoped and expected, the primary reasons (other than personal or geographic)—i.e., the most important or next important out of five levels of importance to the decision--- that our admits chose another university over Duke were due to faculty research interests (56%) and their perception of Duke's reputation compared to our competitor (39%). However, 26% of the responders listed the amount and/or duration of the financial support offered by Duke as a primary reason for declining our offer.

[A much smaller percentage (14%) cited the requirement for service at Duke as an important reason to decline. In probing further, we found that, although 67% of the Duke offers required some specified service in return for financial support, exactly the same fraction at the other institution required service. Also, the duration of financial support was the same in about  $\frac{3}{4}$  of the offers, with only 12-15% listing offers of either longer or shorter duration by Duke].

In contrast, 40% of the decliners reported that the amount of financial support offered by Duke was less than that at the institution intended, while only 25% reported that it was more and 35% that it was equal to the competing award. This data indicated to us that, at least with respect to the dollar amount of financial support we were offering, Duke might no longer be competing on a completely level playing field with our peer institutions. In interviews with a number of students who did choose to attend Duke, as well as with Directors of Graduate Study in a cross-section of Duke departments, we also found that many more of our competitors were offering guaranteed institutionally funded support for summer research than we had expected.

For each of the broad fields of Humanities, Social Sciences, Physical Sciences, Biological Sciences, and Engineering we developed a list of universities to which the 75% of the decliners most often actually went for graduate study. We used the private universities on each of the disciplinary groups as a peer group for that set of fields. We then worked to obtain information from web sites, deans, and sometimes department chairs at each of these institutions as to the level and characteristics of the financial support that they typically offer to incoming Ph.D. students. We have succeeded in obtaining this information for nearly all of these institutions, in each disciplinary group, for 2005-06, and have assumed---conservatively, we believe---that the stipends and insurance packages offered by those institutions this past year will increase by 4% and 10%, respectively. We then compared the packages of support we will offer to new Ph.D. students matriculating in the Fall 2006 class to those of the peer institutions, and the results are reported and analyzed in the following paragraphs. One should remember that the numbers presented for Duke *include* the substantial stipend increases in most fields that we have budgeted for 2006-07, as well as the addition to that stipend of a payment for health insurance (at the level

for an individual student in the Duke Student Health plan) at the anticipated level of \$1750 per year.

### **Humanities and Social Sciences:**

The amounts in this and the following sections have usually been rounded to the nearest \$100.

The support package being offered by Duke to Ph.D. students for 2006-07 in the Humanities and Social Sciences amounts to \$18,800 for the academic year in addition to tuition and registration fees. This package consists of a base take-home stipend of \$16,500; a payment of the health fee of \$560; and a payment for Duke Student health insurance of \$1,750. The median package offered by our peers is \$20,600. Thus, even with the already scheduled large increases for 2006-07, the Duke package remains **\$1,800 less than the median** of the 11 universities in our peer group for the Humanities and Social Sciences. Duke is in 10<sup>th</sup> place out of the 11. The period of guaranteed (or, in reality, backstopped) support is 5 years at both Duke and the median institution. (The range of support offered, including health insurance/fees, is \$15,600 to \$22,200).

Duke offers entering students in the Humanities and Social Sciences the opportunity to compete for an award of summer research support of \$4,000 stipend plus \$180 in health fees (in addition to payment of the summer registration fee) to be used in the summer following the 3<sup>rd</sup> to 6<sup>th</sup> year of matriculation at Duke, as long as the preliminary examination has been passed prior to using the award. Students can, in principle, receive the award twice while at Duke, but, in fact, with only 50 awards available, and usually about 80-90 applicants, no one has ever actually received a second year of summer support through this award. Six of the 11 peer universities, including Duke, offer summer research support to Humanities/ Social Sciences Ph.D. students. For those institutions that offer the support, the median stipend is \$4,000 (as at Duke), but the median number of years of support offered is 2.5, for a median total package of summer support amounting to \$10,000 in all. (The range of stipend is \$3,500 to \$5,000, and the years of support from a nominal one, at Duke, up to 4.) At the 5 peers that offer summer support, that support is not competitive, as it is at Duke, but **guaranteed**. Because each entering Ph.D. class in the Humanities/ Social Sciences at Duke consists of about 120 students, of whom an average of about 90 remain during the years in which students are eligible for the support, the average years of summer support actually available to each entering class at Duke is only about 0.55.

All but one of our 11 peer institutions in the Humanities/ Social Sciences offer supplementary stipend awards, analogous to our James B. Duke fellowships, to the top group of admitted students, in order to attract that group. In total, Duke's award of \$4,000 for each of four years, i.e., \$16,000 in all, to its James B. Duke fellows, is exceeded by only one of our peers (which offers \$4,000 for five years). The median supplementary award is \$2,000 (range \$1,000 to \$4,000), and the median award is for 4 years (range 2 to 5 years). The median total package amounts to \$9,000 in value (range \$2,000 to \$20,000). Importantly, however, while Duke is able to offer James B. Duke fellowships to the top 10% of its matriculants, the supplementary award goes to 20% of new matriculants at the median peer institution (range is 10% to 30% of matriculants).

If one adds the supplementary award to the basic stipend package, Duke's offer of \$22,800 to incoming James B. Duke fellows is exactly at the level offered by the median of our peers. That is, with the exception of the low level of summer support offered by Duke, we can compete on a financially level playing field for the top 10% of our matriculating students. Unfortunately, at our

median peer institution, this type of award is made to 20% of new matriculants, so that we are still not really competitive for this second decile of our applicant pool.

If one adds together the basic stipend package and summer support over a 5 year period, Duke offers \$97,800 as compared to the median of \$103,100 for our peers. Duke places 9<sup>th</sup> of the 11 peers. (Range is \$78,000 to \$127,100.) If one does the same thing for the top group of applicants, then Duke's award of \$113,800 compares to \$115,100 offered by the median competitor, and Duke places 7<sup>th</sup> of the 11 institutions. (Range is \$96,700 to \$137,100). Again, Duke's total offer for the James B. Duke fellows is probably competitive, while its offer to the other 90% of the admitted students is much less so.

### **Natural Sciences:**

The support package being offered by Duke to Ph.D. students for 2006-07 in the Natural Sciences amounts to \$19,300 for the academic year in addition to tuition and registration fees. This package consists of a base take-home stipend of \$17,000; a payment of the health fee of \$560; and a payment for Duke Student health insurance of \$1,750. The median package offered by our peers is \$20,500. Thus, even with the already scheduled large increases for 2006-07, the Duke package is **\$1,200 less than the median** of the 14 universities in our peer group for the Natural Sciences. Duke is in 13<sup>th</sup> place out of the 14. The period of guaranteed (or, in reality, backstopped) support is 5 years at both Duke and the median institution. (The range of support offered, including health insurance/fees, is \$17,300 to \$23,700). At all of these institutions, summer support is usually offered to students in return for work on a research project. This support usually comes from external grants, but sometimes it comes from institutional (at Duke, these are usually departmental) funds.

All but 3 one of our 14 peer institutions in the Natural Sciences offer supplementary stipend awards, analogous to our James B. Duke fellowships, to the top group of admitted students. Duke's award of \$4,000 for each of four years, i.e., \$16,000 in all, to its James B. Duke fellows, is the best of our peer group. The median supplementary award is \$2,000 (range \$2,000 to \$4,000), and the median award is for 4 years (range 2 to 5 years). The median total package amounts to \$10,000 in value (range \$4,000 to \$16,000). Importantly, however, while Duke is able to offer James B. Duke fellowships to the top 10% of its matriculants, the supplementary award goes to 20% of new matriculants at the median peer institution (range is 10% to 30% of matriculants).

If one adds the supplementary award to the basic stipend package, Duke's offer of \$23,300 to incoming James B. Duke fellows is exactly at the level offered by the median of our peers. That is, with the exception of the low level of summer support offered by Duke, we can compete on a financially level playing field for the top 10% of our matriculating students. Unfortunately, at our median peer institution, this type of award is made to 20% of new matriculants, so that we are still not really competitive for this second decile of our applicant pool.

If one adds together the basic stipend package over a 5 year period, Duke offers \$96,500 as compared to the median of \$104,155 for our peers. Duke places 13<sup>th</sup> of the 14 peers. (Range is \$86,000 to \$118,300.) If one does the same thing for the top group of applicants, then Duke's award of \$112,500 compares to \$113,100 offered by the median competitor, and Duke places 9<sup>th</sup> of the 14 institutions. (Range is \$96,700 to \$124,600). Again, Duke's total offer for the James B. Duke fellows is probably competitive, while its offer to the other 90% of the admitted students is much less so.

**Engineering:**

The support package being offered by Duke to Ph.D. students for 2006-07 in Engineering amounts to \$24,500 for 12 months (summer support is normally part of the base stipend) in addition to tuition and registration fees. This package consists of a base take-home stipend of \$22,000; a payment of the academic year and summer health fees of \$740; and a payment for Duke Student health insurance of \$1,750. The median package offered by our peers is \$25,700. Thus, even with the already scheduled large increases for 2006-07, the Duke package is **\$1,200 less than the median** of the 9 universities in our peer group for Engineering. Duke is in 7<sup>th</sup> place out of the 9. Support is usually provided to attainment of the degree, with a major portion coming from research grants. (The range of support offered, including health insurance/fees, is \$23,500 to \$29,700).

Six of our 9 peer institutions in Engineering admit to offering supplementary stipend awards, analogous to our James B. Duke fellowships, to the top group of admitted students. Duke's award of \$4,000 for each of four years, i.e., \$16,000 in all, to its James B. Duke fellows, is the best of our peer group. The median supplementary award is \$2,750 (range \$2,000 to \$4,000), and the median award is for 4 years (range 2 to 4 years). The median total package amounts to \$9,000 in value (range \$4,000 to \$16,000). Importantly, however, while Duke is able to offer James B. Duke fellowships to the top 10% of its matriculants, the supplementary award goes to 20% of new matriculants at the median peer institution (range is 10% to 30% of matriculants).

If one adds the supplementary award to the basic stipend package, Duke's offer of \$28,500 to incoming James B. Duke fellows is exactly at the level offered by the median of our peers. That is, with the exception of the low level of summer support offered by Duke, we can compete on a financially level playing field for the top 10% of our matriculating students. Unfortunately, at our median peer institution, this type of award is made to 20% of new matriculants, so that we are still not really competitive for this second decile of our applicant pool.

If one adds together the basic stipend package over a 5 year period, Duke offers \$122,400 as compared to the median of \$128,400 for our peers. Duke places 7<sup>th</sup> of the 9 peers. (Range is \$121,300 to \$148,500.) If one does the same thing for the top group of applicants, then Duke's award of \$138,400 compares to \$140,200 offered by the median competitor, and Duke places 5<sup>th</sup> of the 9 institutions. (Range is \$121,300 to \$156,500). Again, Duke's total offer for the James B. Duke fellows is probably competitive, while its offer to the other 90% of the admitted students is much less so.

**Biomedical Sciences:**

The support package being offered by Duke to Ph.D. students for 2006-07 in the Biomedical Sciences amounts to \$26,500 for 12 months (summer support is normally part of the base stipend) in addition to tuition and registration fees. This package consists of a base take-home stipend of \$24,000; a payment of the academic year and summer health fees of \$740; and a payment for Duke Student health insurance of \$1,750. The median package offered by our peers is \$27,500. Thus, even with the already scheduled large increases for 2006-07, the Duke package is **\$1,000 less than the median** of the 12 universities in our peer group for Biomedical Sciences. Duke is in 9<sup>th</sup> place out of the 12. Support is usually provided to attainment of the degree, with a major portion coming from research grants. (The range of support offered, including health insurance/fees, is \$25,000 to \$29,700).

All but 2 of our 12 peer institutions in Biomedical Sciences offer supplementary stipend awards, analogous to our James B. Duke fellowships, to the top group of admitted students. Duke's award of \$4,000 for each of four years, i.e., \$16,000 in all, to its James B. Duke fellows, is the best of our peer group. The median supplementary award is \$2,750 (range \$2,000 to \$4,000), and the median award is for 4 years (range 2 to 4 years). The median total package amounts to \$9,000 in value (range \$4,000 to \$16,000). Importantly, however, while Duke is able to offer James B. Duke fellowships to the top 10% of its matriculants, the supplementary award goes to 20% of new matriculants at the median peer institution (range is 10% to 30% of matriculants).

If one adds the supplementary award to the basic stipend package, Duke's offer of \$30,500 to incoming James B. Duke fellows is exactly at the level offered by the median of our peers. That is, with the exception of the low level of summer support offered by Duke, we can compete on a financially level playing field for the top 10% of our matriculating students. Unfortunately, at our median peer institution, this type of award is made to 20% of new matriculants, so that we are still not really competitive for this second decile of our applicant pool.

If one adds together the basic stipend package over a 5 year period, Duke offers \$132,400 as compared to the median of \$137,300 for our peers. Duke places 9<sup>th</sup> of the 12 peers. (Range is \$125,200 to \$148,400.) If one does the same thing for the top group of applicants, then Duke's award of \$148,400 compares to \$147,600 offered by the median competitor, and Duke places 5<sup>th</sup> of the 12 institutions. (Range is \$125,200 to \$157,600). Again, Duke's total offer for the James B. Duke fellows is probably competitive, while its offer to the other 90% of the admitted students is much less so.

### **What Needs to be Done, and What Will it Cost?**

- Duke's offers of financial support to its top 10% of admitted students are probably competitive (i.e., at or near the median of its peer group) in each broad disciplinary area of the Graduate School, with the possible exception of the Humanities and Social Sciences, where the absence of at least 2 years of guaranteed summer stipend support may put Duke at a slight disadvantage. Our peer institutions which offer such awards, however, most often make them to about 20% of the new matriculants, thus putting Duke at a clear disadvantage for the pool of high quality students that is just below the top level as judged by the faculty selection committees.

**Goal: Double the number of James B. Duke fellowship awards that we make to each entering class at Duke. This represents an increase of 42.5 fellowships for each entering class. When one accounts for approximately 10% attrition that occurs in the years 1-4 population of James B. Duke awardees, this amounts to about 150 additional fellowships when a steady state is reached in 4 years.**

*The incremental cost of this expanded J.B.D. program would be \$170,000 in its first year, increasing to \$600,000 by the fourth year after its institution.*

Duke's limited number of fellowships to support summer research in the Humanities and Social Sciences put it at a clear disadvantage in recruiting top students in these fields. The current stipend of \$4,000 plus \$180 in health fees (provision of the summer registration fees represents in fact a waiver of revenue with no net financial impact on the university) is fully competitive, however the number of years of support needs to increase from the present 0.55 per matriculant (when attrition until eligibility in years 3 through 6 is taken into account) to at least 2, and the support must be guaranteed rather than competitive.

**Goal:** Increase the current number of 50 summer research awards in the Humanities and Social Sciences to 180 per year.

*The incremental cost of this expanded summer research fellowship program would be \$543,000 per year when it is fully in place.*

*In order to reduce the immediate cost, while meeting the implicit commitment that there would be one year of support available, albeit on a competitive basis, to each matriculating Humanities/ Social Science student, the current program should be immediately expanded to provide 1 full year of guaranteed summer support to current Humanities/ Social Science students during the 3<sup>rd</sup> through 6<sup>th</sup> summers following matriculation. This would add 40 more awards to the current number at an immediate cost of \$167,200.*

*A commitment to the full program should be made to students entering next year, and the additional cost associated with the next 90 awards would need to begin to be met only in the 3<sup>rd</sup> year after matriculation of those students.*

- Although the increase in base stipends and the addition of health insurance to Ph.D. student support packages for students put into place for 2006-07 certainly is an important step toward putting Duke on a level playing field with respect to its offers of basic financial support to admitted students, our data shows that the stipend package offered by Duke for Fall 2006 is still substantially below those offered by its competitors. The deficiency in stipend amount ranges from about \$1,000 in the Biomedical Sciences, to about \$1,200 in the Natural Sciences and Engineering, to about \$1,800 in the Humanities and Social Sciences. This gap will only grow, even if stipends are increased only at the rate of inflation by our competitors, unless Duke finds the means to increase stipends at a rate faster than our peers. Without taking into account the increased costs to research grants of increasing stipends for students supported by such grants in the sciences and engineering to these higher levels, the cost to Duke of raising the stipend levels of the nearly 1100 Ph.D. students supported on institutional fellowships, assistantships, and traineeships will be substantial. Nevertheless, this is something that we believe needs to be done, sooner rather than later, if Duke is to remain financially competitive for students sought after by both us and our peer institutions.

**Goal:** Raise stipend levels to the median of our peer group in each broad disciplinary area of the Graduate School.

*We estimate the number of FTE's supported in departments and programs by Duke institutional funds (whether through the Graduate School or other schools and departments), both restricted and unrestricted, is approximately 430 in the Humanities and Social Sciences and 220 in the Natural Sciences divisions of Arts and Sciences. The cost of raising the stipends in these programs to the median level of our peers would be \$1,038,000.*

*In Engineering, Medicine, and the Nicholas School, the number of institutionally supported Ph.D. students (including trainees, whose stipends must be supplemented in most cases by Duke to reach the recommended levels) is approximately 80, 170, and 35, respectively, for a total cost of about \$308,000. In Fuqua, all 85 students are institutionally supported, and if their stipends were raised to the Social Sciences level, the incremental cost could be \$153,000. In addition, the series of approximately 50 competitive fellowships (e.g., Duke Endowment, Bass Instructors, etc.) funded by the Graduate School on endowed*

*or other funds, if raised to the average level of the various Arts and Science divisions would cost \$80,000 more.*

*The total incremental cost to Duke University of bringing its Ph.D. stipends for both current and newly matriculating students for 2006-07 to the median level of its competitors would thus be \$1,570,000.*

*A more conservative option: Given the large increases in support put into place for current students in 2006-07, it could be decided that the levels of stipend increases necessary to make us competitive for the best new students only be applied to newly matriculating students. (The currently enrolled students would certainly object vociferously to this.) If this were done, the institutional cost for the first year would be approximately \$600,000. The cost would increase to approximately \$1,080,000 in the second year (this is a rough approximation), and then gradually increase in the next two to three years to the full level of \$1,570,000.*

- If we add up all of the costs for the three goals of 1) doubling the number of James B. Duke fellowships, 2) of providing two years of guaranteed summer research support for each class of entering Ph.D. students in the Humanities/ Social Sciences, and 3) of raising the level of Ph.D. stipends to the median of our peer group in each broad disciplinary area of the Graduate School, we come to \$2.71 million when the steady state is reached. The full costs of the J.B. Duke program would in any scenario only be reached in the fourth year after initiation of the program. Even if everything else proposed were implemented immediately (i.e., the stipend increases were applied to both new and current Ph.D. students who are in the years of committed support by Duke), the total cost in the first year would be \$0.38 million less than that in the steady state (year 4). **Thus the maximum total cost in the first year would be \$2.33 million.**

The immediate cost could be reduced to \$0.94 million in the first year if the conservative approach suggested above were used. Nevertheless, even in the latter scenario, the annual costs would escalate rather quickly: to about \$1.58 million in year 2; \$2.24 million in year 3; \$2.54 million in year 4; and \$2.71 million in the 5<sup>th</sup> and subsequent years. All of these amounts must, of course, be adjusted for the fact that our competitors will not be standing still, and their stipend packages are likely to increase at rates significantly above inflation. We must also take into account the burden that increased stipend costs put on the research grants and other external funding sources that provide more than 50% of the stipend support for Ph.D. students at Duke.

### **How Could We Accomplish these Goals?**

First, it might be useful to examine the relative magnitude of the incremental cost with respect to what we are already spending in institutional funds to support Ph.D. students at Duke. Although our data on the sources of student funding is complete only for 2004-05, if we extrapolate that data to the stipend levels that are budgeted for 2006-07, and include the provision of health insurance by the Graduate School to students otherwise supported on research grants or other external funds (at a cost of \$1.6 million), we estimate the total amount of institutional stipend support (including health care costs) provided to Ph.D. students at Duke will be \$24.2 million in that year. The first year cost of implanting the full program outlined above thus amounts to an increase of 9.6% in the expenditures that Duke would otherwise be making to support those students.

Unfortunately, most of the increased cost would fall upon the Graduate School itself, which would in any case be spending about \$14.0 million to support its Ph.D. students. The incremental cost of the new program, if fully implemented, would represent an increase, in the first year, of about 17% in the budget of the Graduate School. With its current commitments, the Graduate School is budgeted to operate at a deficit of \$0.9 million in its unrestricted and endowed funds accounts. Given its reserves, the Graduate School is able to absorb this deficit, which is entirely due, in fact, to its one-time commitment to ease the transition of adding the cost of student health insurance to research grants that support Ph.D. students. If the Graduate School were not making this commitment, it would be showing a budget surplus of \$0.7 million in its combined accounts for 2006-07. Thus, the Graduate School could without much difficulty have absorbed most of the \$0.94 million first year cost of implementing the conservative approach to the three goals described above. Use of a portion of the Graduate School's Strategic Initiative Reserve funds, which must be approved by the Provost, would certainly have been warranted to begin such an important program to make Duke competitive with its peers for the best graduate students.

Nevertheless, even in the conservative scenario, the costs rapidly escalate after the first year. There are several approaches to meeting these costs.

One, of course, favored by the dean and most faculty, would be for Duke to raise the endowment funds necessary to pay for at least part of the program. Given the fact that between \$50 and \$60 million in endowment would be necessary to fund the incremental costs of the program in the steady state, we cannot realistically afford to rely on this approach by itself.

A second approach would be to raise the registration fees to the level required to meet the entire incremental cost. Let us assume that, if the Graduate School, after one year, stopped paying for the cost of health insurance for students supported on external funds, the Graduate School could absorb \$0.7 million of the cost, leaving a deficit, in the steady state, of "only" about \$2.0 million due to the cost of supporting the new programs when fully implemented. Given the fact that "real" registration fee revenue is expected to total about \$8.5 million for 2006-07 (much of which is due to the 15% increase in the fees put into place to cover the increased stipends and health insurance programs already put in place for that budget year), a fee increase of about 24% would be required to pay for the program---i.e., an increase in academic year fees from \$4,600 to almost \$5,700. (For research grants supporting students for the summer as well, the fees would increase from \$6,900 to more than \$8,500.) This would be happening at the same time as the stipend costs for students paid from research grants were also increasing dramatically (including the transfer of health insurance costs for externally supported students from the Graduate School budget to the grants supporting the student). This does not seem to be a reasonable scenario.

In actuality, however, the net Graduate School budget shortfall, under the more conservative scenario, which, in the first and second years amounts to \$237 K and \$977K, respectively, after the cost of supporting health insurance for externally funded students has been removed from the Graduate School budget, might well be covered, at least in part, by an increase in registration fees. Under that scenario, it must be remembered, currently enrolled students would not be receiving the stipend increases required to make Duke offers competitive for new students, so grants would not be bearing this added cost. The increase in registration fees required in this scenario would amount to 2.8%, or \$128 per academic year, in the first year, and 11.5%, or \$529 per academic year, in the second. Eventually, however, the added cost to grants would reach the steady state levels cited above, and new students coming onto those grants would be receiving the elevated stipends.

A third approach would be to reduce the number of institutionally supported Ph.D. students and use the money saved to fund the new program of enhanced support for a smaller number of newly matriculating students. We estimate that a reduction of about 95 institutionally supported students across the entire Graduate School would be needed to cover the \$2.0 million budget shortfall in the Graduate School due to the fully implemented program in the steady state. In order to obtain this reduction in supported students we would need to reduce the entering classes of Ph.D. students in the Graduate School by about 10% (or 43 students). In reality, there is no way that this reduction would fall equally across the Schools, and sooner or later the brunt of students reduction would be in those areas most heavily dependent on student support, i.e., the Humanities and Social Science departments in Arts and Sciences.

Since the financial pressures on the Graduate School always sooner or later can be relieved by substantial reductions in student numbers that fall primarily in the Humanities and some of the Social Sciences---i.e., the disciplines with distinguished graduate programs, but very limit access to non-institutional sources of funding for their students---another, more general, solution to fund the needs we have described above would be to relieve the burden on the unrestricted funds budget of the Graduate School by endowing fellowship support for the Humanities and some of the Social Sciences. The cost of fully endowing the \$5.0 million annual cost for the 260 FTE's associated with the departments in these areas that are most heavily dependent on institutional funding would be about \$100 million. An endowment that covered 50% to 60% of this amount would free up enough funds in the Graduate School to permit it to implement the \$2.7 million program of increased stipends, merit fellowships, and summer support that is so sorely needed if Duke is to remain competitive for the best Ph.D. students

Realistically, we expect that no one of these methods will in itself be sufficient to solve the problem of funding the needed increases in student support. Some combination of increased endowment, increases in registration fee revenues derived from external sources such as research grants or self-paying Masters students, and down-sizing of the population of institutionally supported students will in all likelihood be needed for us to meet this important goal for sustaining the quality of Duke's Ph.D. programs.

#### **B. A Recommendation to Modify the Graduate School Incentive Formula**

When Lewis Siegel agreed to step down as Chair of the Academic Council to become Dean of the Graduate School in 1991, Duke was undergoing the final stages of changing from a centrally managed institution into one in which the schools were given authority to manage their own revenues and expenses, with guidance and oversight by the Provost, with the dean of each school responsible for the consequences of their decisions as to proper utilization of the resources assigned to that school with the goal of constantly seeking to improve the quality of both the faculty and students and the education and scholarship produced by and within that school. The Graduate School was the last unit to be given this type of responsibility. Upon assuming his position, it seemed to the new Dean that the Graduate School, if it was to meet its responsibility of improving the quality of its students and its programs, needed to have a revenue source to manage, so that it did not have to constantly go hat in hand to the Provost to meet its every need. He proposed a system in which the Graduate School, like any other school, would be credited with the tuition and fee revenue derived from students working toward degrees given by that school, i.e., the Ph.D., and a limited number of Masters degree programs.

Even though there was actually relatively little real net revenue that was being derived from Ph.D. students, whose tuition was, for the most part, fully covered through scholarships, the

deans, at that time, preferred to maintain title to that revenue, while ceding to the Graduate School what became known as the “registration” fee. Because, unlike the tuition, the registration fee was set at a level that could easily be paid by research grants on behalf of students supported on those grants, much of the registration fee revenue proved to be “real”, i.e., it has provided a major net income stream for the Graduate School to use to support its students and programs. Eventually the registration fee revenue stream grew to substantially exceed the real tuition revenue actually paid by graduate students to Duke, even though the nominal “sticker price” for tuition far exceeded the charges for registration. In part, this was due to the fact that the registration fee was charged to every graduate student for each semester that they are enrolled at Duke.

The tuition charged to Masters students was based on the number of course units taken, and provided a not insubstantial revenue stream that was normally split between the department or other unit whose faculty were actually teaching and supervising students in the program and the school housing those faculty. In contrast, tuition was charged to Ph.D. students only for their first three years of matriculation at Duke (in theory these students are no longer taking courses, and therefore require no effort on the part of our faculty after this three year period), and, with the exception of tuition revenues derived from external fellowships, training grants, and a few self-pay students, very little of this nominal tuition income is actually real revenue to the school.

Over time, as graduate programs expanded at Duke, and Ph.D. stipends and duration of support were increased to levels that would permit Duke to compete with the best private universities for graduate students on the basis of faculty quality and interests rather than financial consideration, the Ph.D. programs in each of the schools became dependent on an appropriation (termed the “enhancement”) derived from registration fee revenues assigned to the Graduate School in order maintain a given population of students and to enhance program quality. The Graduate School, at the same time, was using its registration fee revenue to develop programs to enhance the diversity of its student body, to provide training in pedagogy, to work with international students to develop their facility in the English language, to foster a broad range of interdisciplinary activity at the graduate level, to coordinate external reviews of academic programs, etc., as well as to provide the administrative services needed to attract, recruit, enroll, and record the academic progress of the large and widely dispersed population of Ph.D. and Masters students under its purview.

Over the years the Graduate School has come to agreements to manage the budgets, including departmental and program allocations, of the graduate programs in both Arts and Sciences and Medicine, always in consultation with the school deans and/or their delegated representatives. In these cases, the Graduate School was authorized to develop department and program budgets utilizing all revenue sources available for student support in both the Graduate School and its partner school---in effect, graduate tuition and registration fee revenues were combined together with school resources, such as the budget in A&S to support graduate teaching assistants in order to support the graduate programs of the school in as efficient and effective a manner as possible. In such cases, the Graduate School became the guarantor of the “bottom line” in the school codes designated for the support of graduate students and graduate programs in A&S and Medicine. The “bottom line” amount is decided by agreement between the relevant school dean of the Dean of the Graduate School, with the Graduate School assuming the risk of variances in revenues and expenditures that would affect the fiscal health of the graduate programs in the school.

The Graduate School has, at times, been able to use its ability to use its registration fee revenues to support the graduate programs in any of its associated schools to foster major change in the way students are recruited and supported in a given school. For example, in A&S, the relevant

deans agreed that graduate student support would be allocated to departments on the basis of the quality and merits of the graduate programs themselves rather than simply to deliver much needed teaching assistance to the faculty. In Engineering, the Graduate School has insisted on the development of first year fellowships so that students can be attracted without being tied to a particular mentor who provides support to the incoming student from a research grant associated with a fixed project.

The Graduate School has been successful in working with the individual schools without particular regard as to which school “owns” a particular revenue source. Until recently, all schools agreed, either tacitly or openly, that all revenues derived from graduate students would be recycled to support other graduate students and programmatic costs. With this agreement, the Graduate School has been able to put all of the financial resources at its disposal toward the development of student support packages that will keep Duke fully competitive with its peers for the best applicants to any particular program. When choices have to be made and priorities set, the needs of the graduate students and their programs come first when using resources under the care of the Graduate School.

As Duke’s Pratt School of Engineering worked tirelessly to markedly improve the quality of its faculty and its facilities---improvements that could only enhance the ability of that School to attract top quality graduate students---it sought to use some of its Ph.D. student-derived revenues to help pay for these advances. Over time, the need of the School to utilize this revenue source, devoted exclusively to the support of graduate students in all other schools, has begun to compete with the ability of the Graduate School to develop fully competitive packages of stipend support for the students in that School. The Graduate School has utilized all of the registration fee revenues derived from students in the programs of that School to develop a program of needed fellowships and has pushed to improve stipend levels to the median of competitor schools in the discipline. Nevertheless, the constant pressure from the Pratt administration to derive more revenue from its graduate students, particularly those supported on research grants, will soon be forcing limited grant budgets to choose between raising stipends to competitive levels and improving other areas of student support, and meeting the tuition demands of the school. The Graduate School, meanwhile, has been put in the awkward position that if it devotes its own resources to support the students in the School, at least part of the money will inevitably be transferred to be used for purposes other than the primary mission of the Graduate School, just at a time when the need for funds to bring our student support packages to competitive levels has become most pressing.

The Graduate School could meet this situation by asking for additional funding from the Schools (as it has in recent years in Arts and Sciences) to support the needs of their graduate programs, or it could ask the Provost for such funds (which amount to the same thing, since, in Duke’s decentralized system, that would be viewed by the Schools as taking away money that would ordinarily go to them). This may well need to happen. However, before coming to that point, the Graduate School favors continuing the basic approach that graduate student derived revenues are to be used to support graduate students and their programs and not for anything else. (There are exceptions mentioned below in the case of certain Masters programs.)

Given this situation, the Graduate School is driven to propose that it be assigned all revenues derived from payments of tuition or fees by or on behalf of the students enrolled in programs leading to one of its degrees. (The Graduate School would expect, as is its current practice, to split the tuition revenue derived from Masters students with the School and/or department most directly associated with the Masters program, in order to provide an incentive for development and expansion of these programs.) The Graduate School will utilize the Ph.D. and the net

Masters student revenues solely to support graduate students and their programs. Strong priority will be given---as it always has been---to using the resources derived from students in graduate programs supervised by faculty in a particular School to see that the needs of the graduate programs in that school are fully met before the Graduate School would use any of the remaining resources (if any) to support programs in any other School.

As has been the case with Arts and Sciences, and informally with Medicine, the Graduate School would negotiate a “bottom line” based on the revenues and expenses of the graduate programs associated with a given School, and make an appropriation to the School to meet that bottom line at the end of the fiscal year. The Graduate School thus assumes the financial risk for all of its programs, and the dean of each School would be able to count on a defined amount to be appropriated by the Graduate School each year. Under this new formula, there will no longer be any need to have graduate student support and school needs compete for research grant dollars, and the Graduate School will be freed to undertake the daunting task of meeting its goal to achieve fully competitive packages of support for the students in each of its programs.

(As an added bonus, it should be apparent that under this new arrangement there would no longer be any need to continue the always confusing distinction between the revenue stream that goes to the Graduate School, which we term “registration fees”, and that which goes to another school, which we term “tuition”. The Graduate School would simply charge tuition, like any other school, and that tuition charge could be structured differently for each of the several degrees which the Graduate School has been authorized to award.)

### **C. Program of First Year Fellowships in Engineering Ph.D. Programs**

Based in part on the findings of its study of Ph.D. completion rates at Duke, the Graduate School concluded that the financial structure of the graduate programs in Engineering, in which each department and program had served as a “tub on its own bottom” being credited with tuition and fee revenues and charged for student support and a share of Graduate School expenditures for administration and common programs, had not led to a system in which students were uniformly well supported, and, in some cases, encouraged admission of students of somewhat lower quality who could pay tuition to the department. This situation was exacerbated by the decision of the Pratt School administration to charge what amounted to a “tuition tax” (to be \$3,000 per student) to be paid by the department for each Ph.D. student enrolled. Pratt plans to increase that tax in future years. In addition, Ph.D. applicants were routinely selected by faculty for their ability to work soon after matriculation on specific externally funded research projects, and therefore had little chance to explore the various intellectual opportunities available to them for dissertation research in the department. (The term commonly used has been for a faculty member to “hire” a graduate student.)

The Graduate School believes that this is not the way that Duke can most effectively compete for graduate students of the highest quality in most of the Engineering programs, or anywhere else, for that matter. The practice of the biomedical departments and other Natural Science units in recruiting students with fellowship or training grant support, and most importantly, in a way that does not tie them immediately to a particular research project, has become the norm at many of our competitor peer institutions, even in Engineering. It is clear that the best students, even if they come to an institution expecting to work with a particular faculty member, appreciate the option to “look around”, explore the various research projects being done by all faculty in the department or program, and then make a final choice of mentor and project. Such students must be recruited; they cannot be “hired”. In the biomedical sciences, this desire for choice and options by the most competitive students has led to the practice of laboratory rotations in the first

year and the establishment of interdisciplinary, even “umbrella”, admitting programs, in which the student can choose among faculty mentors from several different departments and Ph.D.-granting units.

In keeping with this approach, the Graduate School this past year changed its way of budgeting for Ph.D. programs in Engineering. The Graduate School, which has title to all registration fees paid by students enrolled in its programs, is distributing the fee revenues derived from Pratt graduate students (after deduction of the Pratt share of expenses common to all units in the Graduate School) in the form of fellowships, most of which are to be used to matriculate students in the first year without being tied to a specific research project or faculty member. The Graduate School is actually subsidizing the set of Ph.D. programs in Engineering in order to accomplish the goal of bringing in all students on fellowship or training grant support as quickly as possible. The new system seems to have been reasonably well received by the faculty in Pratt (though by no means unanimously), and it seems that in Fall 2006, nearly all students matriculating into Pratt Ph.D. programs will in fact not be tied to research grant support for at least most of their first year. The Graduate School expects the Pratt faculty to institute, at a minimum, a series of talks by faculty to first year students so that the latter can gain a good idea as to the range of research projects that are going on in the department, and can have a sound basis to choose among them. Eventually, we hope that the practice of laboratory rotations for first year students, so common in the biomedical sciences, will spread to the Engineering and other Physical Sciences programs as well. We strongly believe that it is important that this program of first year fellowship support in Pratt be continued.

#### **D. Other Financial Issues Pertaining to Student Support in the Graduate School**

There are a number of additional important issues that must be considered and decisions made by the Duke administration in the next few years that could have significant impact on the number of Ph.D. students that can be enrolled with competitive levels of support in the Graduate School. These are briefly described below.

#### **Reallocation of FTE's in Arts & Science Ph.D. Programs for the New 3-Year Cycle that Begins in 2007-08**

The Graduate School and Arts & Sciences determine the number of FTE's (i.e., the dollar equivalent of a number of Ph.D. students receiving full stipend, fee, insurance, and necessary tuition support) on a 3-year cycle. The allocation has been based on a weighted set of objective factors including the number of faculty in the graduate program supervising dissertations, Ph.D. completion rates, ability of students to win competitive fellowship awards, the record of the unit in raising external funds to support its students, etc. The financial pressures on the Graduate School described above due to the need to create more competitive packages of financial support make it likely that the number of FTE's that can be distributed among the various A&S departments will be less than it was in the past 3-year cycle. Departments must be aware of this possibility, and it is important that they do not matriculate too many students in the next year, so that they will be able to maintain classes of reasonable size (even if a bit smaller than they are now) in future years while always honoring the commitments made to students already enrolled in their programs. There is also the understandable desire of the administration of Arts and Sciences to reserve a significant amount of graduate funding to support development of graduate programs that are aligned most closely with its strategic priorities.

Ultimately, the problem of financing units which do not have access to sources of external support for their Ph.D. students, but must depend almost entirely on institutional funds for that

purpose, must be faced by Duke. It has always been the case that the Humanities and some of the Social Science Ph.D. programs in A&S have been subsidized by revenues derived from units in the sciences. The pressure on these units, however, is such---particularly given the likelihood that the levels of research support available to support students from agencies such as NIH will decline, rather than increase, in the next few years---that inevitably some other solution must be found if the number of students in these areas is not to decline to unacceptable levels or the Graduate School is not to be placed in a position of bankruptcy. One solution would be for Arts and Sciences, once it gets beyond its current budgetary difficulties, to agree to further subsidization of its graduate programs than is now the case (in financial terms, this means that the Graduate School would manage revenues and expenses associated with A&S graduate programs to a more negative “bottom line”). Another solution would be to make every effort to endow the Ph.D. programs in the Humanities and some of the Social Sciences that have little or no access to external sources of support. (One means of obtaining the substantial amount of endowment needed would be to take advantage of the opportunity to name the Graduate School.) The two approaches are by no means mutually exclusive.

It should be noted that any potential revenue loss to the Graduate School that would result from the shift of the revenue-generating Masters programs in Public Policy from the Graduate School to a new Sanford School would seriously exacerbate the budget shortfall for the Arts and Sciences Ph.D. programs, with the impact falling, as always, most heavily on the programs most in need of institutional support to maintain a reasonable population of Ph.D. students. This is a problem that must be solved in the near future.

#### **Financial Pressure on Ph.D. Students Past the Years of Committed Support**

The Graduate School clearly does not, and probably never will have, sufficient resources to support all Ph.D. students until attainment of the degree. Such support, generally in years 6 and above, comes in science and engineering departments largely through external funding, such as research grants. There are a limited number of dissertation fellowships (e.g., the Stern Dissertation Fellowships), instructorships (e.g., the Bass Named Instructorships), and internships (e.g., Library Internships) available for students in their dissertation-writing years, but the total number (which has roughly doubled in the past five years) is still only slightly more than 15. This number is far too few to support more than a few of the highly meritorious students who need dissertation year support that is not tied to service. Such students usually must take jobs unrelated to their graduate studies to make ends meet, and too many students in this situation simply never complete the degree program. The problem is made worse by the need of the Graduate School to charge a substantial registration fee to all of its students, including students who are not being supported by external funds, but must pay the fee out of their own pockets. We have no immediate solution to this problem, yet it is one that ultimately must be faced if we are to succeed in achieving high rates of completion in the P.D. programs in the Humanities and Social Sciences at Duke.

#### **Increasing the Number of Years for Which Ph.D. Tuition is Charged**

The administration of the Pratt School has decided that it is necessary to utilize some of the revenue derived from charging partial tuition (over and above the registration fees charged by the Graduate School) to Ph.D. students to support its program of faculty and facilities development---a program that certainly will have positive impact on the quality of research that can be performed by graduate students in the future in Engineering. Because, as described previously, there is a significant limit on the amount that can be charged as tuition and/or fees for a single student on a given research grant, Pratt has requested that the Graduate School’s tuition structure,

in which Ph.D. students are charged tuition (as opposed to registration fees) only for their first three academic years at Duke, be changed so that Ph.D. students can be charged tuition for additional years, possibly 5 or 6 (or even to the degree). This change would permit Pratt to derive revenue from the large number of Engineering Ph.D. students who are supported on research grants, but are past their third year. There has been no request from any other School to make this change, and it is not likely than any other School would actually charge tuition (in addition to fees) on research grants in the immediate future.

In principle, the Graduate School has no position on the issue of the number of years for which Ph.D. tuition should be charged. The number varies greatly among schools, and appears to be somewhat arbitrary. Of course, the Graduate School is fundamentally opposed on the use of any revenues derived from Ph.D. students for purposes other than direct support of students or their graduate programs, and it is to limit the diversion of such revenues to these other purposes that we have proposed the modification to the Graduate School formula agreement with the University described above.

## **VII. ACADEMIC SUPPORT PROGRAMS**

### ***A. Training in Teaching***

The Duke Graduate School is committed to excellence in both research and teaching by its faculty and its students, and it has been a national leader in introducing training in teaching as an integral part of the training experience of a Ph.D. Over a decade ago, Duke created one of the first two Preparing Future Faculty programs in the nation---an initiative that has now been replicated in dozens of U.S. graduate schools. More recently, the Graduate School has instituted a number of both formal and informal programs of training in pedagogy centrally in the Graduate School, in addition to working with departments to develop departmentally-based teacher training programs such as the innovative Teaching in Biology certificate program. As part of our annual budget discussions with departments, the Graduate School has insisted that units, wherever it is possible, develop structured teaching experiences for their graduate students that will develop them appropriately for a possible role as independent college teachers. In addition, the Graduate School has taken responsibility for various programming efforts previously led by the Center for Teaching, Learning, and Writing and has expanded these efforts

One of the first steps taken by the Graduate School to enhance the teaching methodologies available to Duke graduate students after submission of its 2000 Plan was to hire Patrick Murphy, from the Center for Instructional Technology, to create and teach a new course “GS301: Instructional Uses of Technology”. Beginning in Fall 2001, the Graduate School made it a requirement for the Ph.D. degree that Duke graduate students complete this course. The course consists of four workshops: Introduction to Using Technology in Teaching; Developing and Using Course Web Pages; Using Technology to Enhance Class Presentations; and Interactivity and Class Communication.

Although the Graduate School has taken a number of steps since the 2000 Plan to expand workshops, courses, and training efforts to improve the pedagogical training of graduate students at Duke, probably our most important step was to recruit Dr. Douglas James, in January 2003, to direct our efforts to make Duke graduate students better teachers. Since Fall 2003, nearly 50 graduate students each semester have enrolled in the new course “GS302: Introduction to College Teaching” taught by Dr. James. The course is a series of workshops that provide graduate

students basic training in how to plan and teach a college-level course from start to finish. It is designed to supplement teacher training already being conducted at the department and program level, as well as through the Center for Instructional Technology. Workshop topics typically include: Planning and Designing an Effective Course; Writing the Syllabus and Learning Objectives; Selecting Teaching Methods and Learning Activities; Grading and Evaluating Student Learning; Becoming a Critically Reflective Teacher; and Preparing for Teaching Positions.

Graduate students are now being given an opportunity to participate in informal talks and discussions with Duke faculty and staff from various departments and programs on topics related to undergraduate teaching, through the Teaching IDEAS programs sponsored by the Graduate School and coordinated by Doug James. Past topics have included: student intellectual life; international student issues; developing a teaching portfolio; discouraging plagiarism; student athletes; gender issues in the classroom; non-tenure faculty positions; service learning; large lecture classes; required courses; and rethinking research papers.

We have also instituted a Graduate School Teaching Fellows program that offers graduate students an opportunity for professional and pedagogical development through creation of pilot and support projects throughout the University. The program also helps to foster the spread of graduate student teaching excellence into individual departments and programs. Fellows propose projects for graduate student teacher development within their departments. Each project focuses on departmental needs, concerns, and interests in better preparing graduate students as teachers. Fellows receive a small Mini-Grant Award to support their project, and these awards have quickly become quite competitive, with 24 applications for four awards this past year. More significantly, the steadily increasing quality of proposals reflects a deeper knowledge of educational theory and a broader level of sophistication in the design of projects that can improve graduate teacher training at the departmental level than we have seen before even among highly motivated graduate students at Duke. Previous projects have included topics as diverse as teaching Music to non-musicians; creation of a teaching resource CD for Religion; a workshop series on teaching in Art History; developing a curriculum for elementary-level Spanish courses; creation of a teaching discussion group in Biomedical Engineering; orientation workshops and a T.A. manual for General Chemistry; developing disciplinary literacies in the interdisciplinary classroom in Women's Studies; developing teaching resources in Pharmacology and Cancer Biology; development of T.A. support materials and training workshop for the Nicholas School of the Environment and Earth Sciences, and many more.

The Graduate School has also been encouraging departments to develop formal programs to train their graduate students in teaching, by making available a Certificate in Teaching in the discipline that can go on the student's transcript after completing such a program. These programs must have defined structures and methods of assessment that are satisfactory to the Executive Committee of the Graduate Faculty. They are not simply Teaching Assistant training programs. Students enrolled in a Certificate in Teaching program are also encouraged to participate in one or more of the courses and workshops offered by the Graduate School to improve the general teaching skills of graduate students. In 2002, the ECGF approved the formation of an official "Certificate in Teaching College Biology" program in the Graduate School which serves as a model program for training future faculty and researchers in the biological and life sciences. Although the Biology teaching certificate is, as yet, the only such departmentally-based program that has been formally approved by the Graduate School, a number of departments have instituted much more structured T.A. training programs than they had previously provided, and the Graduate School expects the number of formal teaching certificates it authorizes to increase substantially in the next few years.

The Graduate School has also published formal *Guidelines and Policies for the Professional Development of Graduate Teaching Assistants* that sets out broad standards for departments to follow in the selection, training, payment, supervision, and evaluation of teaching assistants, and has taken responsibility for assessing the overall quality of the departmental T.A. training programs and their compliance with the Guidelines and Policies established by the institution. In addition, the University has established a Dean's Award for Excellence in Teaching that goes to the graduate student chosen by a committee of students and faculty to best exemplify the best qualities that Duke would want to see in a T.A. assigned to teach our undergraduates.

### **B. The Preparing Future Faculty Program**

The Graduate School has in the past two years taken over responsibility once again for Preparing Future Faculty, a program that originally started at Duke two decades ago and which has become a national force for helping graduate students and postdoctoral fellows prepare for the multiple roles they may be asked to serve as future faculty members in a variety of types of academic institutions. (After the pilot initiative involving Duke, PFF was launched in 1993 as a national program by the Association of American Colleges and Universities and the Council of Graduate Schools. At present, Duke is one of 43 doctoral degree-granting universities that collaborate with nearly 300 partner institutions in the U.S. to form PFF institutional "clusters".) At Duke, the PFF program allows Ph.D. students and postdocs selected as Fellows to participate in a year-long experience that includes professional mentoring with a faculty member beyond Duke, site visits to nearby campuses, and colloquia at Duke on critical issues in academia such as academic freedom, tenure processes, campus governance, teaching, service, etc. These professional development activities provide a wider range of educational experiences than are generally available to students in their departments at Duke. Since the mission, values, student population, and expectations of faculty are distinct to every academic institution, each PFF fellows has a unique opportunity to learn about a broad range of faculty roles and responsibilities. In addition, by being part of the national PFF program, Duke graduate students have access to job listings maintained by the national PFF office that are open only to PFF participants and graduates. Many schools throughout the country offer preferential treatment to candidates who have completed PFF programs.

As mentioned previously, Duke, through the Graduate School, was one of the original founding institutions for the national PFF program. At Duke, one of the most tangible effects of the PFF program are the nearly 300 doctoral students who have received their degrees and successfully negotiated the academic job market. Many of our earlier alumni have now received tenure at their current institutions and are putting into practice the principles and activities experienced at Duke. In the late 1990's, because of staffing considerations, administration of Duke's PFF program was transferred from the Graduate School to the then new Center for Teaching, Learning, and Writing.

When Doug James was hired in 2003, the Graduate School resumed direction of the PFF program. With his leadership, the program has been expanded in both size and scope (for instance, to include Duke postdoctoral fellows). There were 30 doctoral students and five post-doctoral researchers who were PFF Fellows in 2005-06. (This is an increase from the more typical number of 19 the previous year.) The PFF fellows have become an important part of the Teaching IDEAS programs sponsored by the Graduate School. Graduate students who complete the PFF program now receive credit for the course GS300 on their transcripts. We have increased the visibility of PFF to graduate students through our web site, teaching workshops, and courses on teaching and instructional technology. We also, in the past year, formed a new PFF Advisory

Board in collaboration with faculty and senior staff at our partner institutions (Elon, Guilford, Meredith, NCCU, and Durham Tech) to improve the quality of student visits to those institutions, provide feedback, and expand the number and range of faculty mentors available to work with Duke graduate students participating in the program.

### **What is Next?**

The Graduate School has made a considerable effort, since its 2000 Plan, to develop a program of professional development in the area of pedagogy that can truly meet the expectations and needs of its students. The next steps that we envision to enhance this program are relatively modest in nature, and do not involve a large expenditure of resources.

One of our most important goals is to put into place more structured teaching programs in the departments, and, specifically, to develop formal Certificate in Teaching programs in departments such as History, English, Literature, Math, Political Science, Psychology, and Religion, all of which have already taken at least some steps toward developing a more structured program of T.A. training. In order to take additional measures, the Graduate School will need to conduct a survey to update information on the current status of T.A. training and other professional development initiatives in the departments.

We also expect to enlarge the scope of the Graduate School Teaching Fellows program by providing financial support to graduate students to develop specific teacher training materials (probably Web-based) for related departments and disciplines. With the help of these students, we also plan to develop a comprehensive T.A. Resource Manual for all Duke graduate teaching assistants.

Finally, we plan to develop, together with the PFF Advisory Board and the Career Center, an annual series of workshops and events specifically focused on the academic job search process.

In addition, the recent resignation of the specialist in instructional technology responsible for teaching GS301, the required Graduate School course in how to use instructional technology, has given us the opportunity to re-think the position to broaden its scope and make it more responsive to our needs. We will expect the new person hired by the Graduate School to go beyond the teaching of a single course based largely on the basic instructional technology approaches in common use. We envision that the new specialist will:

- \*Maintain close contact with the development of instructional uses of technology within the broad field nationally and internationally, with the goal of making Duke a place where the newest developments are incorporated into the training of graduate students.

- \*Develop detailed training programs in a variety of forums---in consultation with the Graduate School dean, department chairs and faculty, and Directors of Graduate Study---to increase the expertise of graduate students in the uses of cutting-edge instructional technology.

- \*Contribute significantly to development of the capacity of the Graduate School to handle electronically submitted dissertations and theses, with the goal of extending this option to departments beyond those the pilot project that we have recently begun.

### **C. English for International Students**

The Graduate School's English for International Students (EIS) program has as its mission to support the academic life of international graduate students by providing resources that will enable them to succeed in their academic programs and to make the intellectual contributions that the university expects from its graduate students. The EIS program was created by the Graduate

School specifically to help international students improve their academic speaking and writing skills and prepare for greater success in their academic work. The Graduate School recognizes how important it is for international students to have strong language skills, and these courses thus receive the same credit as courses in the disciplines.

EIS courses in oral communication and academic writing focus on the specialized speaking and writing skills graduate students encounter and need to use in the academic community and environment. In addition to the TOEFL exam required for admission, all new international matriculants take English writing and speaking placement exams administered through the Graduate School. Depending on the exam results, students may place into one or more EIS classes. Course enrollment is limited to 12 students to maximize individualized attention for each participant.

The EIS program has seen rapid development and expansion over the past five years. Before 2000, it consisted of two different courses and two instructors, one housed in the Graduate School and one in the University Writing Program. In contrast, the EIS program currently has four full-time faculty and offers multiple sections of four courses. Annual enrollment in the past four years has been approximately 200 students, requiring a total of 17-20 sections per year. As an additional academic resource, tutoring is available at the Writing Studio in the fall and spring semesters to help international graduate students refine and edit course assignments and other writing projects such as thesis prospectuses, conference abstracts, journal articles, and grant proposals. Other EIS activities and responsibilities include: 1) Expanding the academic orientation of all international students to include such issues as grading, plagiarism, communication with peers and faculty, and conventions of academic discourse. 2) Working with faculty in relation to international student academic performance and departmental expectations, including developing individualized instructional resources for at-risk students. 3) Improving communication among domestic students, international students, and faculty, both in the classroom and in less-structured academic settings. 4) Developing reliable testing instruments, conducting academic English proficiency testing, providing departments with reliable information about students' written and verbal skill levels, and placing them in appropriate EIS classes.

Students are placed into EIS courses through the oral and written placement exam given during Orientation Week. Since Fall 2003, the EIS course curriculum has comprised two academic writing and two oral communication courses. The writing courses, GS 320A (Academic Writing I) and GS 321A (Academic Writing II) are a two-course sequence, required as follows: Students in PhD programs who place into Writing I take both courses. Students in PhD programs who place into Writing II take only that course. Students in Master's Programs take one course, whichever one they place into. The oral courses, GS 320B (Oral Communication) and GS 321B (Academic Presentations) are not a strict sequence, although placement is proficiency-based, i.e., students with weaker communication skills and/or severe pronunciation problems place into 320B and more fluent students into 321B. Although ideally, students in 320B would continue to 321B, this could result in up to four English course requirements for some students. To avoid this possibility and simultaneously maximize the likelihood that weaker students will be able to manage with one oral course, GS 320B carries four credits and is the equivalent of 1.5 courses (meeting three times weekly for 75 minutes). EIS courses have a maximum enrollment of twelve students.

In the past three years, a number of specialized EIS sections and workshops have been instituted to meet the needs of specific student groups. Where there were enough students from a given program such as PIDP to fill a section, then material specifically pertinent to the interests of

students in that program has been utilized as much as possible. The EIS faculty has also been working with students to try to achieve a mutual understanding of what it means to be a good teacher in the context of a U.S. research university as contrasted with the experiences and expectations of international students in their home countries (which generally involve much larger class sizes, greater formality in classroom atmosphere and in relationships with professors, limited diversity in the student body, and a more structured lecture format that does not encourage participation or questions in the classroom).

The EIS program has grown substantially in the past five years, reflecting both the growth in the number of international graduate students, and the recognition that a “one size fits all” approach to both language competence and the acquisition of the skills required to understand and present material at the graduate level simply will not work. The next five year period is not likely to see the same kind of growth in numbers as the previous five year period, and it is appropriate to think in terms of consolidating the program and working to adapt it even more closely to the needs of students in a wide variety of departments and programs. The EIS program has set itself the following basic goals: 1) Continue outreach and awareness building of EIS services not as “courses to be gotten out of the way”, but as a support system for international students throughout their academic career. 2) Continue research on departmental and program writing needs and requirements. 3) Incorporate new information from the revised TOEFL tests into our system for evaluating and placing students in EIS courses. 4) Raise writing skills on campus by at least 15% across all graduate school departments in an effort both to prepare students better for successful careers and to support better faculty mentoring of students. 5) Evaluate advanced oral skills needs in graduate school departments and extend services to address areas identified, e.g., pronunciation coaching, targeted practice for oral presentations (preliminary exams, conferences, interviews, dissertation defense, etc.)

#### **D. Training in Responsible Conduct of Research**

At Duke, training of graduate students in the Responsible Conduct of Research (RCR) covers a range of topics relevant to research and professional ethics. RCR is related not only to the obligation of conducting research and teaching with integrity, but also to ensuring that the rights and interests of original sources, human subjects, and/or animal subjects are protected. Moreover, RCR at Duke is framed as a positive obligation rather than the avoidance of “misconduct”. (Research misconduct is defined by Duke University policy as “fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results”.)

Our goal is to promote responsible research and academic integrity within the Duke community by providing regular training and resources on a wide range of topics. The Graduate School offers training events led by faculty and staff across Duke University and Medical Center, experts from nearby institutions in the Research Triangle, and officials from national organizations, including the Council of Graduate Schools, NIH, NSF, and the U.S. Office of Research Integrity.

In response to federal mandates, the Graduate School began formal training in RCR in selected science and engineering departments in 1993. In 2003, Duke became the first university in the nation to make RCR training a formal requirement for the Ph.D. degree in every department and program of study leading to that degree, thus extending that training even to the Humanities and Social Sciences. While training in research ethics had been expanding since the early 1990’s

from the basic medical sciences to other disciplines, this new requirement fulfilled a goal set in 1993 by the Executive Committee of the Graduate Faculty that all Ph.D. students at Duke receive such training. This reflected the expectation of the graduate faculty that every doctoral candidate should be well qualified to address the growing ethical challenges that arise when teaching or conducting research.

Since Summer 2003, all matriculating Ph.D. students at Duke have been required to complete 12 or 18 hours of RCR training depending on their academic program. To accomplish this, each new Ph.D. student must attend one of the three Fall RCR orientations, designated by the course number GS310 (each orientation is specific to a broad academic division of the Graduate School--Humanities & Social Sciences, Natural Science and Engineering, and Biological and Biomedical Sciences) and then should attend at least three RCR Forums (designated as course GS311) or other approved training for credit within the first three years of his/her program in order to meet the number of training hours required for the degree. Several RCR forums (generally 2-hour workshops), coordinated by the Graduate School and covering a wide range of topics, are offered each Fall and Spring. The Graduate School also collaborates with other Duke Schools, departments, campus centers and offices to promote discipline-specific training in RCR issues.

Because the Graduate School and the ECGF have viewed RCR training as a valuable component of a comprehensive graduate education, not simply as compliance to basic policies and procedures, we, at Duke, have supported a program involving interpersonal contact and discussion of RCR issues involving realistic scenarios that can surface in the context of conducting research, rather than rely simply on online RCR training modules, as is the case at many other universities.

Because Duke's Graduate School is viewed as having set a national standard that training in research ethics must be viewed as a required element of any comprehensive graduate education, we have been awarded funding from the U.S. Office of Research Integrity, through the Council of Graduate Schools, to identify best practices in RCR training for graduate students in the biomedical and behavioral sciences. We have used this grant to collect and evaluate comments from participating students immediately following RCR orientations and forums. We have also created online RCR exit surveys to obtain evaluations of the RCR training that they had received at Duke by Ph.D. students who had filed an "Intent to Graduate" form with the Graduate School. Finally, we have conducted focus groups with advanced graduate students and faculty to define what is what is not working in our RCR training programs.

One of the purposes of this grant was also to provide seed money to promote RCR projects within specific departments. To date, only the department of Psychological & Brain Sciences has applied for and received one of these seed money grants.

During the next few years, the Graduate School will work to accomplish the following in the area of RCR training at Duke:

1. Utilize the "best practices" identified in the CGS/ORI-funded project to improve training at Duke and publicize findings to a national audience.
2. Participate in ongoing CGS activities to improve RCR training efforts at Duke, with nearby institutions, and nationally.
3. Work with an RCR Standing Committee reporting to the Provost in order to increase communication and share resources across Duke. (Dr. Elizabeth Kiss is currently leading this effort.), and to clarify and enhance Duke policies relevant to graduate students.
4. Create a separate RCR Task Force of faculty and relevant university staff to work with the Graduate School on program development and evaluation.

5. Fund or seek funding for a new group of RCR Fellows (ideally including both faculty and graduate students) to plan and offer regional events and develop new RCR resources.
6. Hire a program assistant and/or graduate student research assistant to assist with training efforts and maintain articles, policies, and RCR training resources for the Graduate School web site.

## **VIII. STUDENT LIFE: GRADUATE STUDENT AFFAIRS**

### **A. The Office Of Graduate Student Affairs**

With support from The Duke Endowment, the Graduate School established the Office of Graduate Recruitment in 1987 to centralize the recruiting process for all graduate students, and it delineated as a top priority the recruitment of outstanding students of color. This office compiled a consistent record of success: It helped departments recruit underrepresented students, increased the quantity and quality of faculty involvement in the recruitment and retention of these students, sought and received external funding for graduate fellowship support, and provided general counseling support for students. In addition, this office was instrumental in helping Duke to establish linkages with Historically Black Colleges and Universities (HBCUs) through the “Building Bridges to Graduate Education” initiative during the mid-1990s.

Because of the success of this Office in creating a positive environment of support for students of color, Dean Siegel began exploring ways to develop this kind of support for all graduate students. Thus, in 1996, the Office of Graduate Recruitment expanded its mission to include student development and was renamed the Office of Graduate Student Affairs (GSA). GSA is headed by Dr. Jacqueline Looney, associate dean for Graduate Student Affairs and associate vice provost for Academic Diversity. Initially a one-person enterprise, now, 10 years after its creation, the activities of the GSA Office have expanded so as to require a permanent staff of four persons and a budget of more than \$600,000.

The central mission of the Office of Graduate Student Affairs (GSA has always been to enhance the quality of graduate student life by working closely with individual students, student organizations, faculty, and other campus offices. The aim has been to provide a broad array of programs on issues related to graduate student life, such as health, safety, housing, mentoring, and professional development. GSA also has had a particular role in establishing support services that address the specific needs of students from different ethnic backgrounds, international students, gay and lesbian students, students with disabilities, women, and other groups.

In carrying out its mission, GSA has been working actively to: 1) assess the academic, financial, social, personal, and cultural needs of the graduate student community as a whole and identify the special needs of populations within that community; 2) develop programs that address expressed social, emotional, and academic development needs of graduate students and also encourage faculty and student participation in student affairs; 3) assist departments in creating supportive environments for their students; 4) support departments in identifying and recruiting applicants from underrepresented minority groups; and 5) promote and advocate for the needs of graduate students throughout the university.

### **B. Current GSA Activities**

#### **Events and Programs**

GSA puts on a number of events and programs that are designed to meet the practical needs of Duke's graduate students. In addition to these events and programs, GSA coordinates many other activities designed specifically to encourage social and academic interactions among graduate students. Some of the major events and programs:

***Graduate Student Research Day*** showcases the scholarly contributions and talent of graduate students to the entire university community. Students from the entire range of disciplines throughout the university are given an opportunity to explain and share their work to faculty and students who generally are not in their own discipline. The students receive constructive feedback from the faculty on their presentations and all participants have an opportunity to see the range and quality of work that is being done by Duke graduate students.

The ***Ph.D. Career Symposia***, organized and sponsored in partnership with the Career Center, are designed to educate graduate students about alternative career options and provide helpful hints for making the transition from graduate study to full-time employment. There are unusually separate symposia for humanities/social science students and for science/engineering students; each usually attracts between 100 and 150 graduate students. Each symposium involves keynote speakers, panel and small group break-out sessions, and a networking lunch and reception. All of these provide graduate students with the opportunity to discuss career options with Ph.D. alumni employed in the government business, and non-profit sectors.

A recent addition to GSA programs and events is a Spring process to select and a reception held during the Fall semester to honor that year's recipients of the ***Dean's Award for Excellence in Mentoring***. Graduate students nominate faculty, and a student committee selects the awardee. The introduction of this award has been enthusiastically received and praised by a large number of students and faculty, and through such recognition the Graduate School works to cultivate a culture of good mentoring practices throughout all of its programs.

***New Student Orientation*** aids students in their transition to graduate student life at Duke by providing crucial information about the academic community, policies, and resources. A ***Graduate Student Information Session*** takes place during New Student Orientation and features representatives from various University offices and Durham businesses.

The new ***Ph.D. Hooding Ceremony*** provides an important opportunity for faculty mentors and the new Ph.D. recipients to mutually recognize in a public forum the culmination of the long and intensely demanding process that has led to the awarding of the Ph.D. degree.

***Graduate Student Appreciation Week*** recognizes graduate students' contributions to Duke's academic climate with a roster of enjoyable social events and practical workshops on student life issues such as funding, housing, and dissertation support.

### **Student Groups**

GSA provides continuing support for many graduate student groups. Staff members advise and assist several graduate student organizations, including the Center for Integrated Education, Research, and Development (CIERD); the Black Graduate and Professional Student Association (BGPSA); the Bouchet Society; Duke Chinese Students and Scholars Association (DCSSA); DukeOUT; the Graduate and Professional Student Council (GPSC); Graduate and Professional Parents (GAPP); the Graduate and Professional Women's Network (GPWN); the Hurston-James Society; Latino Grads; the Society of Duke Fellows; Women in Science and Engineering (WiSE); and many others.

### **Communications**

To strengthen communication among graduate students, faculty, and staff, GSA sponsors a number of resource publications, many of which are now available online under “Staying Informed” in the Student Life section of <http://www.gradschool.duke.edu>. The *GRIND*, a newsletter posted online twice a year for all graduate students and faculty, highlights particular student issues, features student profiles, and identifies university resources. *Thinking About Graduate School?*, the official Graduate School recruiting brochure, provides information about graduate study at Duke and the graduate school application process in general. The *Prescription for Persistence* Series is available online in the Student Life section of <http://www.gradschool.duke.edu> and gives current students strategies that will help them throughout their graduate careers. GSA will continue to expand its efforts to enhance communication within the graduate school community. GSA has also recently developed the Graduate School’s first promotional video (also available as CD or on the Web), *Duke University Graduate School: Where Your Presence Matters*, for distribution to applicants, alumni, and friends of the Graduate School. The video not only promotes the educational and student life experiences that can be enjoyed at Duke, but it is accompanied by a section that tries to present in realistic terms what the process of studying for a Ph.D. involves. This is part of the Graduate School’s continuing effort to minimize attrition by trying to ensure that students entire to long and difficult course of doctoral study with full information available to them. In addition, the GSA staff is very active nationally, representing the University and the Graduate School and giving presentations at professional meetings and at national forums concerned with graduate student issues.

### **Advocacy**

The Office of Graduate Student Affairs makes every attempt to assess and to respond to the concerns of Duke graduate students. One prime example of GSA’s advocacy role is the collaborative work done with the Student Disability Access Office in coordinating services for students with disabilities. The Child Care Subsidy and initiatives to recognize and promote best practices in graduate student mentoring also arose from GSA’s response to students’ expressed needs and concerns. In many instances, GSA is the initial point of contact for graduate students, offering informal counseling and advising. Furthermore, GSA acts as the liaison between the Graduate School and the Career Center; Counseling and Psychological Services; the Office for Institutional Equity; the central University Office of Student Affairs; and other campus offices. It works to build graduate and professional community through leadership and collaboration with the Council on Graduate and Professional Affairs, and, through this group, all of Duke’s graduate and professional schools have been able to build solid relationships with the university’s Board of Trustees. The Office of Graduate Student Affairs works to create linkages with Duke’s graduate departments and the university administration. In addition, GSA representatives are members of national committees, graduate consortia, and professional associations concerned with issues related to graduate student life.

### **Minority Program Initiatives**

The Graduate School has a long-standing commitment to increasing the diversity and quality of its graduate student body. Its primary goals are to increase minority enrollment, to provide minority students with sufficient funding to complete their graduate studies in a timely manner, and to promote an academic and social environment where minority scholars can flourish. Aggressive, targeted recruiting strategies are vital to these efforts, and the involvement of Duke’s

graduate faculty and students is central to these strategies. Through the work of GSA, the Graduate School has been able to develop long-term partnerships with other colleges and universities---locally, regionally, and nationally. The work of GSA in the area of minority student recruitment and retention is described in detail in the section on Diversity below.

### **Program Evaluation**

Developing formal and informal mechanisms for program evaluation is crucial in assessing the effectiveness of GSA services and in instituting new programs. Formal evaluation of GSA's programs is carried out through surveys of major activities, followed by analysis and progress reports. The ability of GSA staff to track students throughout the admissions process and to prepare retention data continues to be important in the assessment of GSA's effectiveness. Informal evaluations of GSA events are conducted with individual students, student groups, and graduate faculty. In order to create a forum for feedback on GSA programs and proposals, to serve as a resource in program development, and to help in adopting specific strategies to meet program goals, the Graduate School has recruited a group of faculty, students, and staff representing each broad disciplinary area in the Graduate School to serve as a Graduate Student Affairs Advisory Committee. This committee of highly motivated and dedicated people has been an important source of innovative ideas and constructive criticism that has been very important to the progress of GSA in meeting its goals of service to the graduate students and the Graduate School community as a whole.

### **C. What is next?**

The Graduate School's active engagement in serving the needs of its highly dispersed and diverse group of students, both in the academic and non-academic spheres, has been one of its major contributions in the past decade. Most of the activities cited above, conducted through GSA under the leadership of Jacqueline Looney, have come to real fruition in the period since submission of the last academic plan. Over the past five years, GSA has proven itself to be an effective catalyst in the progress and development of the university's graduate student body. But there is clearly much more that can be done.

In the past year, the Graduate School has undertaken an extensive survey of what other universities are doing to enhance the lives of their graduate students. Dean Siegel, as well as members of the GSA staff, together with several Duke graduate student leaders, have attended national workshops designed to explore issues that are most important to the students themselves, and to try to assess how well we are doing in addressing those issues as compared to peer institutions. The encouraging news is that we are clearly on the right track, but while we are, without question, national leaders in the type of core activities outlined above, it is clear that, even as we improve and expand on existing programs, we need to work on developing new initiatives as well.

### **Professional development**

Doctoral training is designed to prepare students to become independent thinkers and researchers. Faculty advisors provide critical academic training during the student's career. Departments may or may not provide directed training in all critical areas, such as grant writing, job search, application and negotiating processes, various types of faculty positions, and alternative career paths. Today's Ph.D. graduates have a broad range of employment opportunities, from faculty member at a college or university, industry researcher, administrative writer, government advisor,

filmmaker, entrepreneur, to high school teacher. More than half of Duke's Ph.D.s pursue careers outside the academy.

Professional development should be at the forefront of students' minds at every stage of their graduate careers. Our surveys of Duke graduate students show that this is indeed the case. Many students want to have professional development opportunities that complement their research training and augment their skill sets to help them identify careers and career settings in which they will thrive. This is true both for students that aspire to faculty positions and those that do not. Students have recognized that the broad skill set that comes with carefully planned professional development activities offers them greater flexibility as they enter the job market.

The Graduate School offers a variety of courses, workshops, and services to help students advance their career goals. It devotes a great deal of attention and significant resources toward teaching graduate students how to become better teachers---through our teaching workshops and courses, teaching certificate programs, and T.A. training activities. The communication skills that graduate students acquire along the way are certainly applicable to careers other than teaching itself. Our Preparing Future Faculty program has been very successful in helping graduate students explore what it means to be a faculty member at different types of educational institutions. The strong support that the Graduate School gives to the activities of organized graduate student groups works to develop leadership skills for those students who choose to participate, and certainly helps to foster a sense of community among graduate students. Nevertheless, we believe that creation of a more organized system of developing leadership skills among our graduate students is important, and we are investigating modalities which might achieve this goal.

Our student surveys have indicated that five professional development topics are consistently at the top of students' lists: job search essentials--from CV's and resumes to negotiation; how to write successful grants and publications; effective oral communication; designing and teaching courses; how to effectively use university resources while still a student. We have begun to respond to these expressed needs by working with other units within and beyond the university to provide more professional development resources to Duke graduate students: a group of workshops in grant and publication writing, put on in collaboration with the student-led (and GSA supported) Center for Integrated Education, Research, and Development (CIERT), is an example. Nevertheless, we believe that there is much more that we can and should do in this sphere, and we are actively exploring models at other universities---particularly the University of Texas---Austin and the University of Michigan, which have been particularly active in this area.

### **Career counseling**

The demand for career counseling services has become an important concern to graduate students at Duke, particularly since it has become increasingly apparent to many Ph.D. students that they may not find suitable job opportunities in the traditional academic sector. A perhaps disturbing number of such students have decided that the types of things that faculty are required to do in order to obtain adequate support for their research are not what they want to do. They are seeking to find alternate career opportunities that will make suitable use of the skills that they are acquiring in their graduate training, but are finding that their faculty mentors and colleagues are generally not knowledgeable about careers outside of academe. In some cases---far too many---students have seen their fellow students rebuffed and even chastised by faculty mentors who believe that their doctoral training would be wasted if the student did not at least try to follow in the path of the mentor. Many students are even afraid to seek advice and counseling from faculty. Although there are a number of excellent resources available to such students through the Web,

there is no substitute for the attention of a knowledgeable and sympathetic career advisor in these situations.

The Career Center at Duke provides a tremendous resource for all Duke students. Given its limited resources, however, the attention that it can devote to the special needs of the extremely diverse needs of Ph.D. and Masters students is limited, and many students have sought counseling services that are just not available, given the level of central Career Center staffing that we have at Duke. This is not to say that there is anything intrinsically wrong with the basic idea of an overall Career Center that is designed to serve the needs of graduate as well as undergraduate and professional students. At least two institutions that we have surveyed, Harvard and the University of Chicago, have well developed and heavily staffed units for graduate career services within their university career offices. Only Yale, as far we know, has gone the next step to a separate career office dedicated solely to graduate student service and housed in the graduate school's administrative complex. We believe that it is time for Duke to consider creating a dedicated career and professional development services unit, within the Graduate School and probably associated with GSA, that is dedicated to the needs of graduate students.

### **Alumni Relations**

Duke University has not made full use of the interests, talents, and resources of its Graduate School alumni in a variety of spheres---such as establishing extensive career networks to help counsel and aid our graduates in finding suitable employment, advising us as to new programs and directions that we should be taking to help our students transition to the "real" world after graduation, and, certainly, in being active contributors to the financial needs of the Graduate School. It is not clear that the various offices at Duke responsible for alumni relations and development even have a full database that would enable us to contact most of our alumni. This is a sad situation, given the fact that the Graduate School has the second largest group of alumni at Duke---over 16,000. It is true that Graduate School alumni often think only in terms of their departments and disciplines and have little loyalty to the institution as a whole---certainly not to a Graduate School, which until the past couple of decades, was not a highly visible unit or one with which they ever had much contact. This has begun to change as the Graduate School has reached out to current and past students through GSA.

The Graduate School will be working to develop a much stronger alumni base in collaborative efforts with the Office of Alumni Affairs, the University Development Office, and the Duke Alumni Association. The decision of the Alumni Association to focus on creating a Career Network of Duke alumni, with a particular emphasis on graduate and professional alumni, is a most welcome step in this direction, and we will actively cooperate in this activity. We have begun the outreach process by producing the award-winning *Where Your Presence Matters* video that describes what it is like to go to graduate school at Duke, and have sent it to all alumni contributors as well as to prospective new students. We are now sending copies of the Graduate School newsletter, the *GRIND*, to alumni as well. But this is just the beginning of the work we need to do in this area.

### **Mentoring**

The Graduate School has long recognized that the most important thing that a graduate student can do to be successful at Duke is to find a suitable mentor or mentors. A diverse group of mentors is best suited to help students learn and navigate both their academic and non-academic paths. Through a variety of Graduate School publications, including a special issue of the *GRIND* dedicated to highlighting successful mentoring experiences and techniques, through the

Roundtable discussions Deans Siegel and DeNeef held with Directors of Graduate Studies in all departments and programs three years ago, and, particularly, through the establishment two years ago of the Dean's Award for Excellence in Mentoring, we have worked to improve the quality of mentoring for students by faculty at Duke. We want to capitalize on the tremendous interest and excitement among both faculty and students that has been generated by the existence of the Dean's Award for Excellence in Mentoring and the publicity that we have been able to generate showcasing the good work that has been done by our award winners. Our goal is to get faculty (and students) to understand what actually constitutes good mentoring and how important it is to a successful outcome to the experience of a graduate student at Duke. We will work with departments to help them take the next steps toward developing effective mechanisms to ensure that students receive adequate mentoring support. We will continue to publicize examples of good mentoring in all of our communications outlets, and partner with student groups and other schools throughout the campus to enhance and assist in new and existing mentoring initiatives.

The Graduate School supports and will be actively engaged in trying to achieve the program to enhance mentoring by Duke faculty and students outlined in the February 2006 report of the Duke Graduate and Professional Student Council (GPSC) to the Student Affairs Committee of the Board of Trustees:

- Provide training in workshops on what graduate and professional students expect, and how to mentor, provide effective feedback to students, approach students who might have problems, and find resources for students. This could be a voluntary certification program for faculty, many of who may have never had experience mentoring others.
- Continue to encourage mentoring through awards.
- Make graduate mentoring and teaching a more significant consideration in decisions about faculty promotions and raises.
- Make faculty aware of alternative career paths so that they can better advise students.
- Provide opportunities for graduate and professional students to learn to be effective mentors. Graduate students in the sciences are often asked to train undergraduates working in lab, which gives many a chance to learn the skills necessary to guide and teach others. Unfortunately, many students do not have this opportunity. Setting up programs for interested graduate and professional students to both learn teaching and mentoring skills and put those skills into practice will benefit the Duke community in a number of ways

### **Student Health**

The Graduate School is obviously concerned about the health and physical well-being of its students. We have worked actively, together with GPSC leadership and Student Affairs administrators, to secure the best services possible for health care and health insurance for graduate students that the always limited financial resources available to us would permit. The Graduate School took a giant step forward in adding payment for the cost of health insurance under the Duke student health plan for an individual student to the stipends provided to support Ph.D. students. This major financial commitment should have the effect of reducing the rate of premium increase in this plan by removing the incentive for the youngest and healthiest Duke doctoral students to seek less expensive, and usually less inclusive, health insurance coverage elsewhere, a phenomenon which has placed an increased cost on the rest of the students enrolled in the plan. At the same time, now that the Graduate School is bearing so much of the cost of health insurance for a large proportion of its students, it is important that representatives of the Graduate School, as well as of the students themselves, be much more directly involved in

negotiations as to what benefits will or will not be added to the Duke student health insurance plan.

It is also important that the University be much more proactive in promoting greater availability and use of health care resources---particularly the Student Health Center and CAPS--- that could minimize the growth in student health insurance premiums. The University should explore incentive mechanisms (such as instituting or raising co-pays) to minimize the cost to the health insurance plan for services that are not used effectively, such as unnecessary use of the Emergency Room. The Student Health Center must be, as was intended, the first stop for students who need primary medical care, and the Graduate School must work actively, together with GPSC and the SHC, to see that this is well understood by the graduate students. A “flip” side to this approach is that the SHC must be able to offer more of the commonly utilized services that are now referred to more expensive physicians outside SHC.

Finally, it is important to the Graduate School that affordable health care be available to the entire range of the graduate student population. We recognize that to accomplish this, there will inevitably some cross-subsidization of some students by others within the premium structure for student health insurance. While we do not anticipate that the Graduate School will, in the foreseeable future, be able to directly provide the cost of health insurance premiums for the families of individual enrolled students, we are committed to seeing that the additional health insurance premium costs incurred by graduate students for necessary coverage of dependents are not so great as to make it financially impossible for those students to continue their graduate training. In a similar vein, the Graduate School is not sympathetic to instituting categories of health premiums that would differ significantly for different groups of graduate students (e.g., older students incur, on the average, greater health care costs than do younger students; coverage of maternity costs is gender-specific).

### **Child Care**

The Graduate School has recognized the need to provide support for the needs that a growing proportion of its student population have in finding adequate care for their small children if they are to complete their degree programs in a timely fashion, or, indeed, at all. The Graduate School has instituted a subsidy for child care that is available to Ph.D. students with demonstrated financial need, and this expensive program has clearly made an important difference in the lives of Duke Ph.D. students with young families. Nevertheless, it is not financially possible for the Graduate School to be able to cover more than a small fraction of the cost of child care needed by graduate students at Duke. One solution to this problem might be for the Graduate School, through GSA, work with student leadership and other units of the University to promote and support the creation of informal child care networks among graduate and professional students and their spouses.

A related issue is the fact that there is an increasing practice among major research universities to establish written formal policies for maternity and/or parental leave for graduate students, which generally ensure that students supported through funds that are paid out by the university (e.g., research grants, traineeships, university fellowships and assistantships, etc.) are able to receive their normal funding for a fixed period (usually 6 to 8 weeks) after the birth of a child. There is currently no such policy at Duke, and it will be incumbent upon the Graduate School to work toward creating one, if we are to match our support of students with that of peer institutions.

### **Combating Isolation**

As stated above, one of the most important missions of the Office of Graduate Student Affairs is to find ways to reduce the sense of isolation and the resultant stress than are associated with the long and difficult process of working toward a Graduate School degree (particularly the Ph.D.). National studies have suggested that the lack of integration of students into a community (either academic or social, or both) is one of the most important factors that cause students to leave without completing their degree programs. There are particular problems encountered by some students due to language barriers, family demands, and the environment within specific departments. The Graduate School is committed to expanding its already substantial efforts to combat isolation by providing community and networking opportunities for graduate students through organizing and supporting student groups and sponsoring events that bring students from different areas within the Graduate School together. We also expect to work with other units of the University to develop a series of workshops that would bring students together to discuss issues such as combating isolation, how to better faculty-student relationships, effectively managing time, issues involved in parenting, etc. We also need to do a better job of helping faculty to better understand these issues so that improved systems of support for students can be developed at the departmental level.

### **Physical Facilities**

There is now consideration of major changes in the physical layout of the Duke campus, many of which will have serious impact on the lives of graduate students. We will work with the Central Campus Planning Committee to make sure that the housing needs of graduate students---particularly international students---are met by Central Campus reorganization plans. Provision of more safe and convenient on-campus housing for graduate students would be of particular importance to the many students who must travel back and forth to laboratories at odd hours of the night, and it would also be helpful in increasing the participation of graduate students in the general life of the Campus.

We also intend to work with the University Office of Student Affairs, the senior leadership, and the professional schools to secure a dedicated space for a potential Graduate Student Center and develop a plan for the center's layout, staffing, budget, and program components. Such a Center would be important to our efforts to combat isolation and build a sense of community among the tremendously diverse group of students enrolled in the Graduate School, as well as to foster networks between students that share common interests or cultures. Space and proper facilities for the activities and services associated with GPSC and other formally organized student groups is essential, of course, as is some form of space for social gatherings, but it would also make sense, it seems to us, to place many of the University and Graduate School student support services---e.g., an enhanced graduate student Career Center, CAPS, etc.---close together in a common building.

Finally, although the Graduate School has no real control or influence in this area, it is incumbent upon us to comment on the need for improved facilities for graduate students in the departments and schools themselves. Many departments have little or no space for graduate students to study together, have small meetings, or socialize; and there is often inadequate office space for students serving as teaching assistants to meet with undergraduates.

### **A Concluding Remark**

After surveying the student life landscape and assessing its own activities in the past several years, the Graduate School is emboldened by what it has learned. Few comparable institutions can boast of the outreach to students, attention to student needs, and increase of graduate student visibility and meaningful participation in the university's mission that we see at Duke. Collaborative productions such as the *Power of their Presence* and *Making Knowledge Useful* presentations (prepared primarily for the Board of Trustees) and the *Where Your Presence Matters* video have heavily involved the students, together with faculty and alumni, in a common enterprise to show to the wider world what it means to be a graduate student at Duke. Innovative programs such as the Graduate Student Research Day and the Dean's Award for Excellence in Mentoring have provided mechanisms to bring together students and faculty from across the university in assessment and celebration of achievement in the academic life at Duke. We have every reason to expect that, through the work of GSA, the Graduate School can continue to make the graduate experience at Duke as enriching for students as it could possibly be.

## **IX. DIVERSITY**

Diversity in the Duke University Graduate School means effectively two things: concerted efforts to recruit minority and historically underrepresented students in all graduate programs, but particularly in doctoral programs; and a steady increase over the past decade in the number of international students applying to and matriculating in these programs. These two factors compel different kinds of institutional effort.

### **A. Growth in the Number of Minority Students in the Graduate School**

The Graduate School began aggressive recruitment of minority students in 1987 by establishing an office dedicated specifically to the recruitment and retention of minority students. As a result of the efforts of this office, in the decade from 1985 to 1995, the number of U.S. minority students enrolled in Duke graduate programs increased by 3.5-fold (from 60 to 210) and the proportion of such students in the graduate student population increased from 3.5% to 9.3%. There was a concentrated effort during this period to focus on the recruitment of African-Americans. This effort was highly successful, as evidenced by the fact that the number of African American students enrolled in Duke graduate programs increased four-fold (from 26 to 102), and the proportion of African-Americans in the overall graduate student population tripled, from 1.5% to 4.5%, in the same period.

The following decade saw a substantial drop in the number of U.S. students applying to graduate school between 1995 and 2001, followed by a strong rebound in the past four years. The drop in applications in the earlier period was accompanied by a proportionate decrease in the number of U.S. minority and African-American students matriculating into Duke graduate programs, although the total enrollments of such students did not actually decline. During the past four years, the growth in the number of U.S. minority graduate students enrolled at Duke has resumed, so that by 2005, the number of such students had increased to 353 (an increase of 68% from the 1995 enrollment), and the U.S. minority portion of the Graduate School enrollment had grown to 12.6%. There was also significant growth in the number of African-American graduate students, to 137 (an increase of 34% from 1995). The proportion of enrolled graduate students who were African-American increased slightly, to 4.9%, in the period from 1995 to 2005.

### **B. The Graduate School's Report for the Black Faculty Strategic Initiative**

When the Black Faculty Strategic Initiative came to a close 2 ½ years ago, the Graduate School submitted a report summarizing its record in matriculating and graduating African-American graduate students during the previous decade, with particular emphasis on the Ph.D. students, since these provide the pool for future Black faculty in the U.S. Our data was complete for the nine year period beginning in 1995. Over this period, the Graduate School was able to matriculate 127 African-American Ph.D. students (average of 14 per year), the majority of whom were attracted with the aid of Duke Endowment minority fellowship support. During the 1995-2003 period, Duke graduated 80 new African-American Ph.D.s (average of 9 per year) in a total of 22 different disciplines. The rate of African-American Ph.D. graduation at Duke has increased markedly over the nine-year period: in the first six years (1995-2000), an average of 7 African-American Ph.D.s (2.9% of the total Ph.D.s) graduated, in contrast to an average of 13 (5.7% of the total Ph.D.s) graduating in the final 3 years (2001-03).

The great majority of the African-American Ph.D.s produced at Duke over the 9 years were in the Humanities and Social Science disciplines (61 of 80 total, or 76%). Of these African-American Ph.D.s, 19 were in History, 9 in Business Administration, 8 in Psychology, 6 in English, 5 in Literature, 4 in Religion, and 3 in Cultural Anthropology. Unfortunately, Duke has not been able to attract a comparable number of African-Americans into Ph.D. programs in the Science and Engineering disciplines, and only 19 of the Ph.D.s produced in the 9-year period (or 24%) have been in those disciplines. 13 of these have been in the Biological Sciences, and only 3 each in the Physical Sciences and in Engineering.

As a result of substantial efforts put forward by the Office of Graduate Student Affairs in cooperation with dedicated faculty, as reflected in the introduction of a highly successful Pre-Application Graduate Visitation Day targeted at talented minority undergraduates with research experience and the Summer Research Opportunity Program for undergraduates in the Biological Sciences, the picture in the Sciences and Engineering has begun to change. In contrast to the period 1995-2000, in which an average of 4.5 African-American students matriculated at Duke for Ph.D. study in the Sciences and Engineering, the average number for 2001-03 was 7.3. As of Fall 2003, there were African-American Ph.D. students enrolled in 15 different programs in the Sciences and Engineering, and disciplines such as Biomedical Engineering, with 6, and Environment, Genetics, Neurobiology, and Pharmacology, with 3 each, began to develop a possible “critical mass” of African-American graduate students. In contrast, in 1995, no Science or Engineering discipline at Duke had more than 2 African-American Ph.D. students enrolled.

As mentioned above, one of the cornerstones of Duke’s commitment to attract the most promising African-American Ph.D. candidates has been the Duke Endowment minority fellowship program. Since its inception, 46% of African-Americans entering Ph.D. study at Duke were recipients of the Duke Endowment Fellowship. The success of the program in attracting highly qualified Ph.D. candidates is shown by the fact that 76% of African-American Duke Endowment Fellows have completed Ph.D. study at Duke by attaining the doctoral degree, as compared to 60% of the African-American Ph.D. students who did not receive the fellowship, and, most notably, in contrast to 63% of the general population of Ph.D. matriculants at Duke over the same time period. The high completion rate for black DE Fellows is seen in all areas of Ph.D. study except for the Physical Sciences and Engineering (where the number of black Ph.D. students qualifying for the fellowship has been less than one per year).

The high completion rate for African-American Ph.D. students at Duke is in marked contrast to the record of U.S. graduate schools in general. The typical pattern is that approximately 50% of all students entering Ph.D. study complete their degree programs, with the completion rate for black Ph.D. students significantly lower than that (usually 30-40%). Duke’s record in selecting

and attracting African-American graduate students of the highest quality and then providing resources sufficient to permit the great majority of those students to successfully complete their Ph.D. programs, at a rate even greater than that of the Ph.D. student population as a whole, represents a major contribution by Duke's Graduate School to the important goal of increasing the pool of African-American scholars and potential faculty in the nation

### **C. *Minority Student Recruitment and Retention***

One of the important roles of the Graduate School's Office of Graduate Student Affairs is to lead, coordinate, supplement, and expand the recruiting efforts of graduate departments and programs with the aim of increasing the representation of minority students in the Graduate School. Each year GSA sends members of its staff or pays the expenses of faculty and/or students to participate in recruitment fairs across the country in addition to making campus visits to Historically Black Colleges and Universities and other universities in order to recruit top graduate students. GSA staff also attend national conferences that feature undergraduate research and provide professional development and mentoring activities for underrepresented students.

Some of the other GSA recruitment activities include: the Summer Research Opportunities Program in the Biological Sciences (a 10 week summer research program at Duke); the Post-baccalaureate Research Education Program (a one to two year program in the biological sciences to enhance the academic background and research experiences of underrepresented students in the biological sciences); The Graduate School Visitation Program which targets specific graduate student candidates; participation in collaborative programs such as the Institute for Recruitment of Teachers, the National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM), National Name Exchange, and Project 1000; and targeted mailings using national networks such as the Name Exchange, Mellon Mays Undergraduate Fellowships, recruitment fair contacts, and the Ronald E. McNair Post-baccalaureate Achievement Program. GSA also participates in national conferences related to the recruitment and retention of talented under-represented minority students, sharing and receiving information on best practices around the country. In addition, GSA facilitates networking by coordinating and publishing an email directory of summer research programs and their participants at Duke and UNC-Chapel Hill and building strong working relationships with faculty at Duke and other institutions around the country. Many such programs are designed specifically to attract students from underrepresented groups in science, math, engineering, and technology. These efforts by GSA to attract and recruit underrepresented minority graduate students to Duke are described in a bit more detail below:

**SROP: Summer Research Opportunities Program in the Biological Sciences.** The major goal of the program is to encourage minority students to pursue a career in the biomedical sciences and as a secondary goal to increase matriculations to Duke graduate programs, both directly and indirectly. Funded by the Mellon Foundation, this program supports approximately 10-12 students per year in a 10 week summer research experience which matches students research interests with faculty mentors.

**PREP: Post-Baccalaureate Research Education Program.** The major goal of the program is to encourage minority students to pursue a career in the biomedical sciences and as a secondary goal to increase matriculations to Duke graduate programs, both directly and indirectly. This program is designed to give underrepresented students the opportunity to obtain more experience and preparation in the biological sciences before they apply to doctoral programs. PREP scholars are recent graduates of an undergraduate institution who engage in one to two years of intensive research, formal coursework, and other activities to enhance the skills necessary for admission

and success in a doctoral program. The program, funded by the National Institutes of Health, supports 10 PREP scholars at any given time.

The Graduate Visitation Program. The purpose of this program, first introduced in 1999, is to introduce 50-80 highly talented underrepresented students from across the country each fall to the programs and offerings of Duke University's Graduate School and to encourage them to consider Duke as a place to pursue their graduate studies. It is an annual two-day event that features focused activities and interviews. Activities typically include seminars on graduate admissions and financial aid, panel discussions with faculty and graduate students, departmental visitations, and informal gatherings with current graduate students and departmental staff. Students are accepted for this special program by application only. Graduate School staff and faculty in the appropriate departments review applications, and acceptance is determined by the student's academic curriculum, grade performance, and commitment to research. Candidates are recruited from the following undergraduate research programs: Mellon Mays Undergraduate Fellowship, Meyerhoff Scholarship Program, Minority Access to Research Careers Program, Ronald E. McNair Post-baccalaureate Achievement Program, Institute for Recruitment of Teachers, The Ralph Bunche Institute, and the SROP at Duke, PREP, and undergraduate honors programs at universities around the country.

The program has been quite successful, in that about 75% of the visiting students actually apply to Duke for graduate study, about 50% are offered admission by Duke departments and programs (the majority with Duke Endowment or external fellowship support), and more than 40% of these eventually matriculate at Duke. In addition to this Visitation program, GSA also hosts special campus visits of under-represented minority student groups and individuals from around the United States who have expressed interest in exploring Duke's graduate programs.

Recruitment Fairs and Travel. Graduate School staff, students, and faculty regularly participate in graduate recruitment fairs and make visits to selected majority universities and HBCU's. During the 2004-2005 academic year, recruiting trips included: The Atlanta University Center Graduate and Professional School Fair, Washington DC Area Graduate and Professional School Fair, Baltimore Area Schools Fair, Annual Biomedical Research Conference for Minority Students, Southern California Forum on Diversity, National McNair Scholars Conference, Southeast Mellon Mays Scholars Conference, Cornell University, Dillard University, Johnson C. Smith University, New York University, Loyola University, Tulane University, and Xavier University of Louisiana.

Targeted Mailings. GSA reaches over 6000 talented students through targeted mailings to aid in recruiting efforts. Mailings are regularly sent to the coordinators of Mellon Minority Undergraduate Fellowships, National Name Exchange, Recruitment Fair contacts, Ronald E. McNair Post-baccalaureate Achievement Program, GEM programs, NSF and NIH funded programs, and honors programs. The Graduate School has also purchased an online prospective student registration tool to allow students easy access to our information, personalized information about Duke and research opportunities, and pre-arranged visits to Duke.

As to the future, the Graduate School must continually re-examine and probably expand its current mechanisms for recruiting students from under-represented groups. Although GSA has, since its creation, been very active in co-sponsoring activities such as the SROP and PREP programs in the biomedical sciences, it is clear, particularly given concerns that have become increasingly noted in reviews of our training grant applications in the biological sciences, that we need to do even more.

GSA has been responsive to these issues by re-configuring its recruiting methods. More emphasis will be placed on sending current graduate students back to their undergraduate institutions to give presentations to a targeted group of students, brought together by deans, faculty members, or student groups at that institution. Graduate student recruiters will be accompanied by an interested Duke faculty member. The schools to which the GSA-sponsored students and faculty will travel are selected based on the lists of the top 25 schools for African-American, Hispanic, and Native American students. Some of these schools, including Harvard, MIT, Columbia, and Stanford, are among the the top 25 universities that produce students competitive for admission to Duke. GSA staff will continue to recruit at national conferences that highlight the work of talented undergraduates. Given the pressures on GSA staff as the office has expanded its scope and activities, it is very likely that the Graduate School will need to provide an additional staff person in this area.

The mission of the Graduate School's Office of Graduate Student Affairs is to enhance the quality of the graduate experience at Duke, thus increasing completion rates, productivity, and the overall well-being of all graduate students. Therefore GSA provides general counseling for students--including personal and professional development, mentoring, and support---and develops programs to encourage their participation in graduate student life. It works to develop programs and resources in such a way that they are accessible, inviting, and responsive to the needs of all segments of the graduate community. GSA partners with departments, faculty, student groups, and other universities to provide necessary resources for students. The Graduate School has recognized, however, that there are often special needs of minority students who are often more isolated within individual departments. GSA is recognized as a special source of advice and support that is available to address those needs, often serving as the initial point of contact for any questions, concerns, or crises that graduate students face.

GSA organizes discussion groups and information sessions centered on topics communicated by graduate students. In addition, GSA supports a broad array of programs to bring graduate student groups together, including support of the Black Graduate and Professional Student Association; the Bouchet Society, which serves minority students in scientific and technological disciplines; the Hurston-James Society; the African American Dissertation Support Group; the Duke Chinese Students and Scholars Association; El Concilio Latino/Hispano/Americano; Latino Grads; the Native American Student Coalition; the Graduate and Professional Women's Network; and Women in Science and Engineering, among others. The support includes both administrative and monetary elements.

GSA sees that *The GRIND*, the Graduate School's newsletter sent twice a year to all graduate students, faculty, and to alumni donors, pays particular attention to highlighting the accomplishments of minority as well as all other graduate students, and that it recognizes the diversity of the Graduate School in its profiles of graduate students and faculty.

#### **D. The Duke Endowment Fellowship**

Since 1986, a primary mechanism Duke has used to support its efforts to attract and retain highly qualified students from underrepresented minority groups (African-American, American Indian, and Latino/Hispanic) into its Ph.D.degree programs is the Duke Endowment Fellowship. This fellowship, which is an internally competitive award of full financial support for four years of graduate study, is normally offered to somewhere between 30 and 40 minority students annually. The first two years of this award are straight fellowships (free of service requirements) and are supported from central Graduate School funds. The second two years are supported through normal departmental funding mechanisms, which often includes regular research or teaching

assistantships. (We have found that the strategy of offering support in the form of assistantships as well as fellowships is important in ensuring that minority students are fully integrated into the normal training mechanisms in their degree programs and not isolated from the rest of their peers.) The fellowship also provides funding for the summer months for the first four years that the student is at Duke.

The name of the fellowship is something of a misnomer. Although the Duke Endowment did provide a substantial amount of funding (about \$1.25 million) to begin the program, very little of this was in the form of endowment, and for most of its existence the fellowship program has been funded entirely from unrestricted institutional revenues of the Graduate School (primarily registration fees). The Graduate School's expenditure for stipend and fee support (not including any tuition scholarships) for the Duke Endowment fellowship program will be about \$850,000 for this academic year alone. The Duke Endowment fellowships are the largest single programmatic expense that the Graduate School makes every year.

As stated above, an important goal of the Duke Endowment Fellowship program is to increase the diversity of Duke's Ph.D. population by attracting highly qualified students from underrepresented minority groups. An important emphasis must be placed on the term "highly qualified." The Graduate School's view is that this means a high probability that the long and rigorous program of doctoral study at Duke will be successfully completed by attainment of the Ph.D. degree.

Since, in general, the underrepresented groups targeted for the Fellowship program tend to have lower scores on the Graduate Record Examinations than the general applicant population, and since these groups form a relatively small proportion of the total applicant pool, it is a key challenge for the faculty committee responsible for selecting the Duke Endowment Fellowships awardees to carefully scrutinize the applications and, in many cases, to determine non-test-related qualities that would signify a strong likelihood that the degree program will be successfully completed. Needless to say, such qualities, particularly in students from underrepresented groups, means that students chosen to be offered the Fellowship usually receive multiple offers of admission from other prestigious universities in addition to Duke.

It is important, then, to ask "What has been the success rate for students attracted to Duke with the Duke Endowment Fellowship?" How do Duke Endowment Fellows fare in attaining the Ph.D. as compared with the general student population and with respect to students from the same underrepresented groups who matriculated at Duke, but were not deemed attractive enough by the Duke Endowment Fellowship awards committee to be offered the Fellowship?

We have collected and analyzed data for the period from 1988 to 2003. Needless to say, students matriculating at Duke in the past four to seven years have, for the most part, not had time to complete the Ph.D. program, given the long time to Ph.D. degree in many disciplines (particularly in the Humanities and Social Sciences, which attract a higher proportion of minority students than do the Natural Sciences and Engineering).

For the 16-year period, 492 students from the three underrepresented groups (245 African-Americans, 239 Hispanics, and 8 American Indians) eligible for the Duke Endowment Fellowship matriculated at Duke for Ph.D. study. (This represents 9.3% of the total matriculants for the same period.) Of these entering students, 34% were awarded Duke Endowment Fellowships. The fellowships were not evenly distributed among the various groups: nearly half (46%) of the entering African-Americans received the Duke Endowment Fellowship, while only 21% of the entering Hispanics, and 6 of the 8 (75%) American Indians matriculating in that period received

the award. Given the long time to degree and the Graduate School's effort to increase the number of Duke Endowment Fellowship awards over the 16-year period (there were only 6 Duke Endowment fellows entering in 1988, as compared to 13 in 1998, and 17 in 2003), about half of the entering fellows are still studying in the Ph.D. programs. The data below refers to the students who have ended Ph.D. study at Duke, either by obtaining the Ph.D., or by leaving with a terminal Masters degree or no degree.

For the students who are no longer at Duke, 60% of the Duke Endowment fellows obtained the Ph.D., as compared to 57% of the students of color who did not have the fellowship. (For the overall student population, 63% of entering students at Duke and now finished study have obtained the Ph.D.) All of these completion rates are significantly greater than the national averages, where only about 50% of students successfully complete Ph.D. study, and a much smaller proportion from underrepresented minority groups do so.

These overall figures, however, mask some important information. The Duke Endowment Fellowship program has had remarkable success in attracting African-American students who have been able to successfully complete their Ph.D. programs. Over the 16-year period, 76% of black Duke Endowment Fellows have left with the Ph.D., as compared to 60% of the black students who did not receive the award, and, again, 63% of the general student population. The success of the fellowship students is particularly remarkable in all fields other than the Physical Sciences and Engineering.

In the Humanities, 90% of the entering black DE Fellows have left Duke with the Ph.D., as compared to 66% of the black non-DE Fellows and 61% of the overall student population. In the Social Sciences, 83% of the black DE Fellows have completed with the Ph.D., as compared to 67% of the black non-DE Fellows and 61% of the general population. In the Biological Sciences, the proportions are 80% for black DE Fellows, 68% for black non-DE fellows, and 72% for the general student population. (As might be expected, Duke has been unable to attract very many black students into doctoral programs in the Physical Sciences and Engineering---a severe national problem---and fewer than one black student per year in these areas has qualified for the DE Fellowship. Of the small number of black students who have finished their Ph.D. study in these fields at Duke, only 27% successfully obtained the Ph.D. degree.)

[As stated above, the great majority of Hispanic students entering Ph.D. study at Duke (79%) matriculated without the Duke Endowment fellowship. For the most part, these students either exhibited test scores similar to the general population or were heavily concentrated in degree programs, such as the Romance Studies Ph.D. in Spanish Literature, for which they had special qualification. In the Humanities, about one-third of the entering Hispanics received the Duke Endowment fellowship, and the success in Ph.D. completion for these fellows has been similar to that of the general population and to Hispanics who did not receive the fellowship (all are in the 61-64% range). For the small proportion of Hispanic DE Fellows in the Social, Biological, and Physical Sciences and Engineering (ranging from 11-19% of the entering Hispanics), the success rate has been dismal (0-25%), and, in fact, significantly below that of Hispanics not receiving the Fellowship (45-68%). The reasons for this performance are not clear, but it is clear that the Graduate School must pay serious attention to the non-financial support that we are making available to help this important population of students succeed in all fields of graduate study at Duke.]

The commitment by Duke's Graduate School to increasingly improve the support package it can offer to prospective Duke Endowment fellows has, in the past four years, resulted in the matriculation at Duke of seven African-American or Hispanic students who have achieved the

unprecedented feat of being selected for all three of Duke's top fellowship awards (the Duke Endowment Fellowship; the James B. Duke Fellowship, intended to attract the top 10% of all students offered admission to Ph.D. study at Duke; and the University Scholars Fellowship, awarded to students, selected from the JB Duke Fellowship awardees ranked most highly by the faculty, who show special talent for leadership in interdisciplinary doctoral study). These students, as one might imagine, have all received offers from many of the best universities in the nation, and it is very much due to the type of award represented by the Duke Endowment Fellowship, as well as to the quality of Duke's faculty, that such students can be attracted to study at Duke.

Another indicator of the program's success is that 70% of the Ph.D. recipients who were Duke Endowment fellows are in academic positions at colleges and universities. Of these, 52% are in tenure track positions, while 18% are post-doctoral fellows or instructors. (We note that we do not have placement data for 10 Fellows.) The Duke Endowment Fellows are on the faculty at some of the best schools in the country, including Wake Forest University, the College of William and Mary, the University of Michigan, Cornell University, Duke University, the University of Maryland, University of California-San Diego, the University of Chicago, Northwestern University, Rice University, Syracuse University, Vassar College.

In summary, the Duke Endowment fellowship program has been invaluable in attracting highly qualified minority students, particularly African-Americans, to Ph.D. study at Duke. The combination of careful selection (with very much reduced emphasis on GRE scores), two years of service-free fellowship at the beginning of Ph.D. study, and the strong support offered by Duke's Office of Graduate Student Affairs to minority students, has created a record of success at Duke which is truly remarkable when compared to the record of other universities. At a time in history when programs targeted to under-represented minority groups are under serious attack, it is important to recognize that such programs, if properly constituted, can and do work to achieve the important goal of increasing the pool of talented individuals, with the analytical skills that are derived from Ph.D. training, on which the economic strength of our nation increasingly depends.

As to the future, the Graduate School simply asks that it continue to be supported, in spite of this external pressure, by the administration of the University, as it always has been, to continue to utilize the Duke Endowment minority fellowship program to help increase the diversity of the Graduate School at Duke and to successfully produce Ph.D.s from underrepresented groups who can increase the pool of talented minority individuals who can serve as future faculty and as professional leaders in this nation.

#### **E. International students**

The number and proportion of foreign students enrolled in the Graduate School at Duke has increased almost monotonically throughout the past two decades. During much of the 1990's, as applications from U.S. citizens to graduate schools were declining each year, the number of applications from non-U.S. citizens was rising dramatically, so that in the years 2001 through 2003 there were more foreign than domestic students applying to Graduate School at Duke. As of 2005, nearly one-third (905) of the graduate students at Duke are not U.S. citizens. In some doctoral programs—Business (57%), Civil & Environmental Engineering (61%), Computer Science (57%), Economics (69%), Electrical & Computer Engineering (67%), Physics (51%), Statistics (64%)—international students currently represent the majority of the total graduate student population. International students are, in fact, the total constituency of some specialized Masters programs such as the M.A. in International Development Policy. Since many of these students require special programs in order to successfully become acculturated to academic life in

the U.S., the Graduate School has needed to invest much more heavily in areas that are needed to support these students.

For well over a decade, Duke has provided incoming international students with training in English as a Second Language (now termed English for International Students, or EIS). This program has been described in detail in a previous section. In addition, the Graduate School, along with Duke's International House, provides a variety of orientation programs for newly arriving international students, although it is fair to say that these programs are not as extensive as they could or should be. We have tried to supplement them with some experimental peer-mentoring programs, primarily in some of the Engineering programs. Perhaps the greatest institutional need at Duke in support of international students is development of more targeted pedagogical training for them. The Graduate School has itself developed a set of *Guidelines for the Professional Development of Graduate Teaching Assistants*, and has urged, in these guidelines, that all graduate programs provide prospective teaching assistants with preparatory pedagogical training before they are asked to serve in the undergraduate classroom or laboratory. The University is in the process of seeing that individual departments and programs comply with this requirement. To this point, however, the Graduate School has not had the resources to offer any significant amount of centralized pedagogical instruction specifically targeted toward international teaching assistants. It will be an important goal for the Graduate School, through its programs led by Dr. Douglas James to improve student teaching in partnership, together with the dedicated EIS faculty (which has experimented with such approaches in the past), to develop a serious program for training ITA's in the next few years.

#### **F, Women's Initiative.**

Duke's Graduate School is concerned about the status of women in higher education and conducted a comprehensive study on female graduate students as a part of the Women's Initiative. While our study showed that the representation of women in Duke's doctoral programs did not, with one or two exceptions, deviate significantly from the gender distribution in the same discipline nationally, the Ph.D. completion rates for women at Duke were significantly lower than those for men in the Humanities and in the Biological Sciences. We also found that women are more concerned than men about the balance between career and family; are more significantly affected by a loss of confidence throughout their graduate careers; and are discouraged by the lack of mentors and female role models. These trends hold for most disciplines but are particularly acute in the sciences. Since the completion of the study, the Graduate School has committed significant funds to assist with child care costs while assuring graduate students have access to Duke's Childrens' Campus. In addition, the Graduate School has hired a director of Student Development to more fully address the issues of students, with a focus on women and minorities. It is clear that there is much to do in this important area if we are to provide the same opportunities to successfully complete their doctoral degree programs to both women and men enrolled in the Graduate School at Duke.

#### **A Final Word**

As the international and under-represented graduate student populations grow and become increasingly diverse, we need to redouble our efforts to understand and meet the needs of every segment of our Graduate School population. Serious consideration needs to be given to targeted recruitment strategies, quality of life issues, funding structures, and resource availability and accessibility for each of the many student groups that make up the most diverse population of

students that exists in any School at Duke University. This is a broad challenge that will keep the Graduate School busy for many, many years.