Final Report of the Committee on Sponsored Research

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1. EXECUTIVE SUMMARY

1.1 Charge to the Committee

The Committee on Sponsored Research was constituted in January of 2014, in order to identify the responses that Princeton ought to undertake in light of changing patterns of government support for research, so as to maintain and enhance its status as one of the world's leading research universities. In making its recommendations, the Committee took into consideration our university's distinctive characteristics, including the central importance of undergraduate education and Princeton's small size.

1.2 Scope

Securing government support through competitive grant applications to funding agencies is a defining characteristic of research primarily (but not exclusively) in the natural sciences and engineering[•], at Princeton as well as nationwide. In these disciplines, all aspects of the research enterprise, including, crucially, graduate students, are supported by sponsored research funding. The scope, quality and excellence of research that is produced by Princeton faculty in the natural sciences and engineering depend vitally on government support. This report addresses challenges and makes recommendations in the broad area of sponsored research at Princeton, hence impacting primarily, but not exclusively, the natural sciences and engineering[¶].

1.3 Challenges

Princeton's research enterprise faces significant challenges stemming from changing patterns of government support for research. These stresses are documented in detail in Appendix 1 (Appendix 1 is the Committee's First Report, issued in October 2014). The most significant ones are:

- The abrupt halt in the growth, and the subsequent decline, of the NIH budget, following its doubling between 1997 and 2003[§].
- The resulting hypercompetitive environment at NIH[‡].
- The decline of the purchasing power of most government grants[fl].

[•] At Princeton, Divisions III and IV. There are important programs and areas of scholarship, like the Office of Population Research (OPR) in Division II (Social Sciences), which conduct sponsored research in a manner entirely analogous to the natural sciences and engineering.

[¶] In what follows, and for the sake of brevity, we refer to the natural sciences simply as the sciences.

[§] In constant (2014) dollars, the NIH budget shrunk by 12% since 2004. See Appendix 1, Figure 3.

[‡] Less than one in eight RO1-equivalent NIH proposals were funded in FY 2014, compared to a 39% success rate in 1979. See Appendix 1, Figure 5. See also report.nih.gov/success_rates/index.aspx

[fl] The size of the average NIH grant decreased from $330K in 2004 to $284K in 2014, in constant (1998) dollars (see Appendix 1, Figure 7; see also report.nih.gov/nihdatabook/index.aspx.) In 2004, the mean annualized award in NSF's Engineering Directorate ($120K) enabled a Princeton faculty member to support 2.1 graduate students; in 2014 the number was 1.7. The corresponding numbers

- The increased (hyper)-competition for scarce federal dollars has led to risk-averse funding mechanisms that favor incremental research that promises highly specific results over risk-taking, bold and innovative research[§].
- Chronic uncertainty about government budgets for basic research, which makes it increasingly difficult to undertake long-term planning on research directions or infrastructure.

1.4 Internal Strengths and a Reaffirmation of the Current Research Model

- In spite of the hyper-competitive environment and significant external stresses, Princeton's faculty has been able to compete extraordinarily well for federal grants, a testament to the faculty's quality[¶].
- Reaffirming the basic model of government-sponsored research as the backbone of Princeton's research enterprise in science and engineering, the Committee's recommendations focus on internal mechanisms to leverage the impact of federal funding on the creation of new knowledge, and on spurring creativity in ways that current sponsored research mechanisms sometimes do not.

1.5 Highest-Priority Recommendations

The committee identified two different and high-impact ways to best support the sponsored research enterprise.

Enabling goals that cannot be fulfilled in the current funding climate:

- Resources to support faculty research, based on three principles: encouraging and rewarding bold, innovative thinking, and new ideas; focusing on the quality and promise of the individual rather than on overly specific, incremental research; make funding recommendations based on a rigorous internal mechanism of anonymous peer review. To this end, two types of innovation funds are recommended:
    - Scientific Innovator funds, for Assistant Professors. Multi-year awards intended to encourage bold, innovative thinking that is discouraged in today's hyper-competitive grant-writing environment.
    - Exceptional Accomplishment funds, for Associate and Full, preferably mid-career Professors. Multi-year awards to encourage bold thinking and the pursuit of new research directions, and to reward an established track record of innovation.

Leveraging the impact of sponsored research, and encouraging and rewarding competition for external funds:

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in the Mathematical and Physical Sciences Directorate are 2.3 and 1.8. 68% of Princeton's NSF funding comes from these two directorates.

§ Alberts, B., Kirschner, M.W., Tilghman, S., Varmus, H. *Rescuing US biomedical research from its systemic flaws*, *Proc. Nat'l. Acad. Sci. USA*, *111*, 5773 (2014).

¶ See Table I below.

- The Committee strongly recommends the creation of a fund that would cover the portion of tuition charged to grants for 4th and 5th-year graduate students supported on sponsored research awards.

- Establish a program of proposal-related funds to encourage faculty submission of proposals to funding agencies and to industry, and to reward success in this endeavor. Funding recommendations to be made by anonymous peer review. The two types of funds recommended by the Committee are:
  - Proposal Preparation funds, to assist with the preparation of proposals, and/or to facilitate the completion of experiments or calculations needed prior to submitting a proposal to a government agency or to industrial sponsors.
  - Matching funds, to reward faculty who have successfully secured new sources of competitive federal or industrial funding.

1.6 Other Recommendations (Ranked in Descending Order of Priority)

- Princeton should undertake a transformative, long-term initiative to raise funds for internally competitive graduate student fellowships.
- Provide a pool of funds to support a yearly internal competition for the purchase of capital equipment for shared facilities.
- Allow deferring 1st-year of external fellowships to graduate students who have been awarded such fellowships in areas linked to sponsored research.
- Increase the size of Corporate and Foundation Relations staff to a level that is comparable with that of peer institutions (accounting for our size), as a means of securing additional philanthropic and industrial sources of funding in support of research.
- Create proposal development positions within the Office of the Dean for Research, whose main functions will be to proactively identify new government funding opportunities and to assist faculty in the writing and preparation of large or interdisciplinary grant proposals.
- Create a task force charged with identifying internal mechanisms for reducing the administrative burden on investigators who perform federally-funded research, while maintaining full compliance with applicable regulations.
- Explore the creation of department-specific policies for 1st-year graduate students aimed at encouraging them to apply for external fellowships, with an overall goal of creating a culture where such applications are expected of eligible 1st-year graduate students.

1.7 Guiding Principle

The reaffirmation of government sponsorship as the backbone of the sponsored research enterprise carries with it the recognition of both the possibilities and the limits of central university funds or philanthropic support to supplement sponsored research funds. When considering the best way to deploy such resources, the Committee reaffirms competition and selectivity as a guiding principle, just as it is for federal funding. Faculty innovation funds would be awarded following a competitive process of internal anonymous peer review. The Committee's recommendations on funds to cover graduate student tuition and on faculty matching funds are also consistent with this principle, since matching allocations would be made only in the case of 4th and 5th-year graduate students supported on sponsored research funds, and to faculty members who have competitively secured federal or industrial funding, respectively.

2. INTRODUCTION

The Committee on Sponsored Research was constituted in January of 2014, in order to identify the responses that Princeton ought to undertake in light of changing patterns of government support for research, so as to maintain and enhance its stature as one of the world's leading research universities.

In October, 2014 the committee issued its first report (included in full as Appendix 1 of this report), summarizing the extensive data collected and analyzed during the Spring of the 2013-14 academic year. The main conclusion emerging from the data, as stated in the report, is reproduced below:

> *In sum, thanks to the exceptional quality of the faculty, Princeton has been able to sustain an excellent overall record of proposal success rate and of research dollars raised per faculty member. Nevertheless, the diminishing or at best flat purchasing power of most federal research grants, the increasing costs of supporting graduate students on research contracts, and the prospect of further decline in proposal success rates at the major funding agencies (NIH, NSF) raise questions about the long-term sustainability of the campus research enterprise as currently configured.*

The Committee identified a hyper-competitive grant application environment, especially at NIH, the decline in the purchasing power of most federal grants, and increasing costs of supporting graduate students on sponsored research grants as key stresses affecting the science and engineering research enterprise nationwide and at Princeton. Selected figures documenting these stresses are reproduced below by way of summary and to put the Committee's recommendations in proper context. Readers should refer to Appendix 1 of this report for full details.

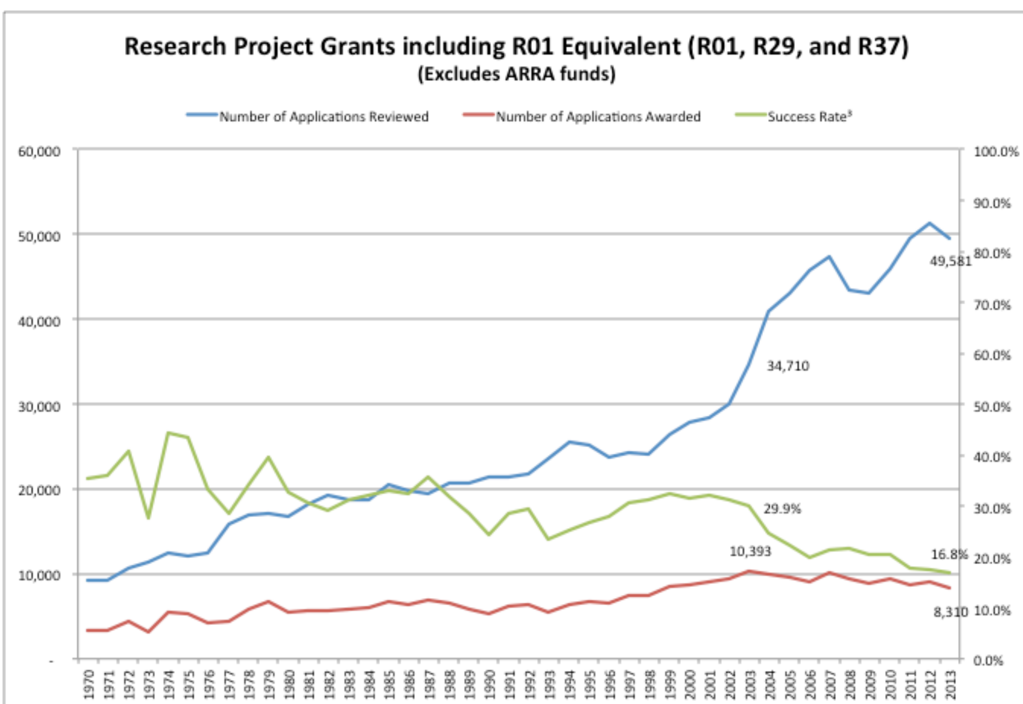

Figure 1: NIH proposal success rates since 1970. Source: see Fig. 2.

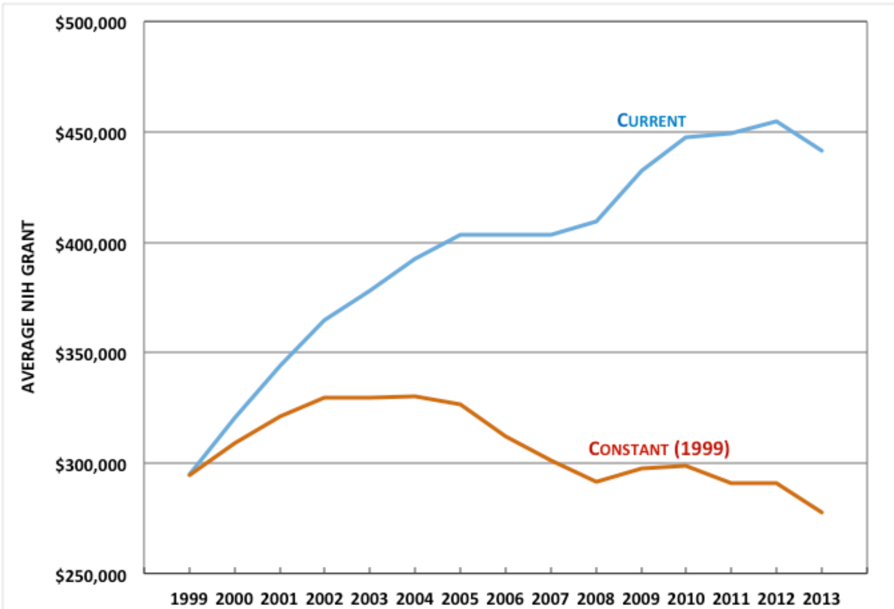

Figure 2: Average size of an NIH grant in nominal and constant (1999) dollars§.

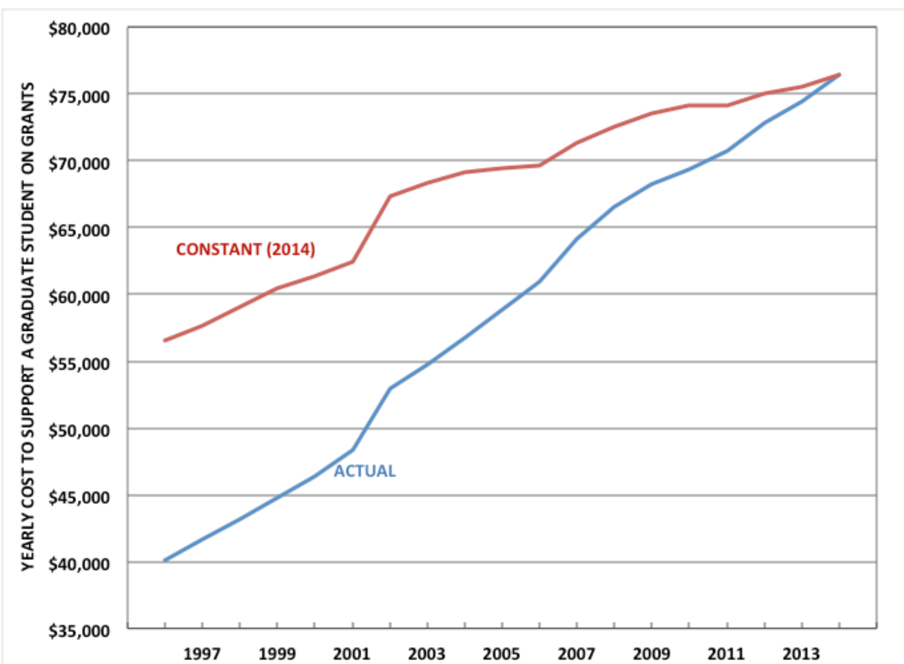

Figure 3: Yearly cost of supporting a graduate student on sponsored research grants at Princeton, in constant (2014) and nominal dollars.

§ Source: NIH Research Portfolio Online Reporting Tools (RePORT), report.nih.gov/nihdatabook/index.aspx

The second phase of the committee's work was aimed at making specific recommendations. To this end, the committee constituted three working groups:

- *Identifying scenarios* (Bassler, Gmachl, Lee, Spergel). Charge: *Taking as given the range of reasonable projections for future trends in federal funding, and assuming no other sources of external funding, what should Princeton's best response be, and what are the likely impacts on campus research activities?*
- *Finding new sources of funding* (Floudas, Ji, Law, Martin). Charge: *What are new sources of corporate, philanthropic and international funding for research, and what are the considerations that should be made in deciding whether to attract them? How might Princeton attract them?*
- *Internal mechanisms for enhancing Princeton's research enterprise* (Debenedetti, Kulkarni, Shafir, Sigman) Charge: How can existing or new resources be optimally deployed in support of Princeton's research enterprise?

The ideas emerging from the three working groups informed the committee's deliberations throughout the Fall of 2014 and the Spring of 2015, and were instrumental in generating the specific recommendations.

2.1 National Context

The national context in which the Committee performed its work is one of uncertainty about our country's long-term commitment to the system of robust government support of basic research[§]. That model, lucidly articulated in Vannevar Bush's 1945 report to President Truman[‡], has been the foundation of the spectacularly successful U.S. research enterprise since the end of World War II. Among the many metrics that capture the present uncertain situation, we choose to reproduce a chart from a recent report issued by the American Academy of Arts and Sciences[ʃ]. Figure 4 shows the rapid decline in our nation's investment in science and engineering research and development (R&D) relative to OECD countries[ﬂ], as measured by the ratio of gross domestic expenditures on R&D (GERD) to gross domestic product (GDP). This is a widely used indicator of the intensity of a country's investment in R&D.

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§ See Appendix 1 for detailed supporting data.

‡ *Science, the Endless Frontier*, by Vannevar Bush. A Report to the President (1945).

ʃ *Restoring the Foundation. The Vital Role of Research in Preserving the American Dream.* American Academy of Arts and Sciences (2014).

ﬂ OECD is an international organization with 34 member countries, whose goal is to promote economic progress and world trade.

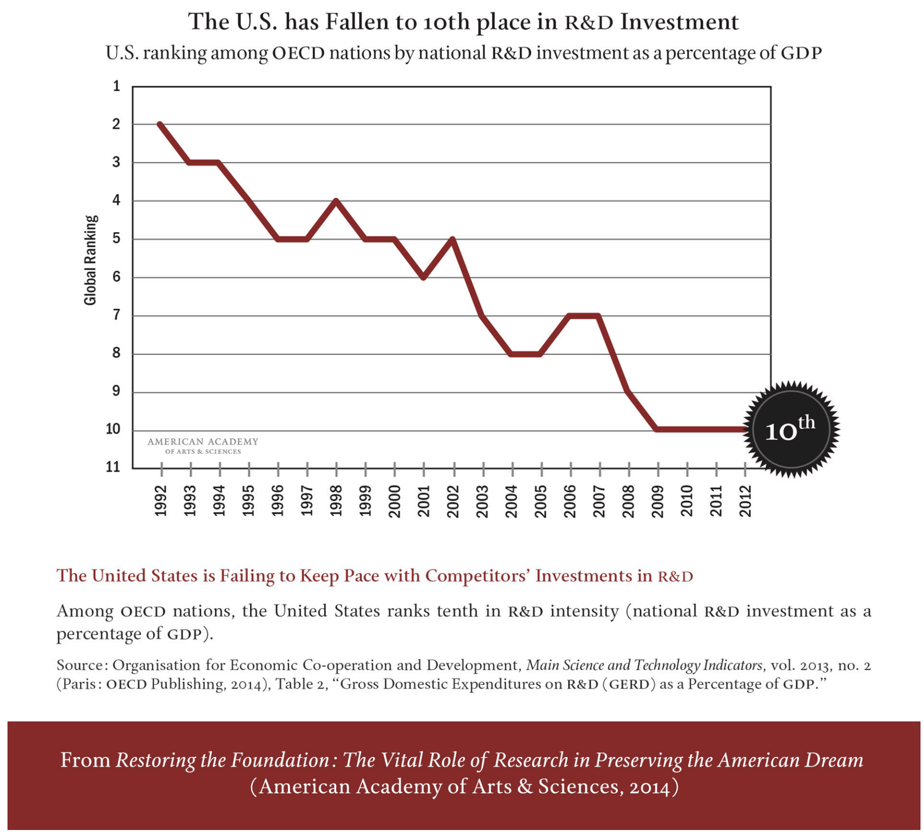

Figure 4: US ranking among OECD countries, as determined by R&D investment as a fraction of GDP. Source: *Restoring the Foundation. The Vital Role of Research in Preserving the American Dream.* American Academy of Arts and Sciences (2014).

Although both major political parties have been broadly supportive of scientific research, science budgets are a modest fraction of the overall discretionary budget¶. Hence, ongoing fundamental disagreements about the role of government in a democratic society have had serious consequences for the funding of basic research (e.g., sequestration) in spite of both parties' avowed support for the research enterprise. Science, in other words, is too small a piece of the federal budget and hence is regularly buffeted by much larger forces.

2.2 A Unique Opportunity

One possible outcome of the uncertainties referred to above, uncertainties that are documented in detail in this Committee's first report (Appendix 1 of this report), would be to adjust Princeton's research enterprise to an environment of diminishing federal support for research. Section 4 summarizes the actions that selected science and engineering departments would be prepared to take in

¶ In the President's FY 16 budget request, the combined NSF, NIH, NASA (R&D), DOE (R&D) and DOD (6.1, basic research) budgets, $65.75B (www.aaas.org/fy16budget/agencies), add up to 5.7% of discretionary spending, $1.15T.

response to a hypothetical worst-case scenario that combines deep cuts in government support for research with poor endowment returns and limited philanthropic success.

In contrast to the above retrenchment response, the Committee, while recognizing current challenges to the research enterprise, sees the present circumstances as an opportunity. Building upon our University's unique strengths, foremost among which is the world-class quality of its faculty (see box), it is possible to enhance Princeton's stature as one of the world's leading research universities, if strategic investments are made. Importantly, the recommended investments complement but do not alter the basic model of government-sponsored research in which our faculty has been consistently able to compete with extraordinary levels of success (see Table I).

In the latest (2014-15) issue of the highly respected Times Higher Education World University Rankings, Princeton and Stanford are the only universities ranked in the top 10 in all the subject areas considered (Arts and Humanities, Engineering, Life Sciences, Physical Sciences, Social Sciences). The subject matter rankings take into account teaching, research, citations, international outlook and industry income, with subject-dependent weights, and are a widely used indicator of overall scholarly excellence.

Table I. Proposal Success Rates (%) in Science and Engineering Departments§

	99	00	01		05	06	07		11	12	13
AST	35	53	37		55	66	66		56	53	56
CHM	41	40	50		44	57	36		42	47	53
EEB	38	54	73		36	46	39		19	44	24
GEO	48	54	42		48	40	49		59	43	33
MAT	38	75	83		85	75	89		76	74	71
MOL	45	52	37		34	27	27		35	35	35
PHY	58	54	62		61	63	70		52	56	63
PSY	31	44	56		31	34	44		33	36	55
CBE	67	43	54		59	57	39		28	37	25
CEE	44	43	57		25	26	49		42	35	39
COS	47	47	53		49	53	59		61	59	36
ELE	45	53	59		40	46	52		33	46	36
MAE	70	63	57		56	47	49		50	44	43
ORF	82	100	85		67	72	72		73	69	54

§ See Appendix 1 for complete data. See also Figures 5 and 6 of Appendix 1 for NSF and NIH historical data on overall proposal success rates. Typical current numbers are ~ 22% (NSF) and ~ 15% (NIH).

The Committee strongly believes that implementation of its recommendations will provide Princeton with significant competitive advantage relative to most of its peers. Two factors underlie this competitive advantage: the extraordinary quality of the Princeton faculty, which ensures the best possible outcome for any given resource investment, and Princeton's modest size, which allows comparatively smaller investments to have much larger impact. Today's external stresses are common to all research universities; only a handful of institutions have the capacity to transform this challenge into an opportunity.

These are uncertain times for research. Unprecedented opportunities for making transformative advances in understanding the human brain and the early Universe, as well as in developing a predictive understanding of Earth's environment, to name but a few examples, coexist with budgetary uncertainty and doubts about our nation's commitment to maintaining its leadership in defining the frontiers of human knowledge. The recommendations of the Committee on Sponsored Research are based on a data-driven assessment of the national and campus environments, strategic thinking in the formulation of priorities, and a realistic balance between aspirational goals and an understanding of the practical limits to university investment in support of its research enterprise. The Committee believes that implementation of its recommendations will enable Princeton to play a leading role in defining the frontiers of human knowledge, by making our research enterprise more competitive, building on the extraordinary work done by our faculty, graduate students and post-doctoral associates, and alleviating the stresses resulting from uncertain budgets, rising costs, and hyper-competition. If, on the other hand, this opportunity is missed, we foresee an environment in which heightened financial pressures may force Princeton faculty members to curtail valuable research initiatives or induce them to entertain offers from other institutions.

3. RECOMMENDATIONS

3.1 High-Priority Recommendations

The Committee's major recommendations address two basic areas: *faculty research funding* and *graduate student support*. These recommendations, even when aspirational and potentially transformative, do not alter the basic model centered on government-sponsored research, nor do they call for the University to replace the government in supporting the research enterprise. At the same time, these recommendations are ambitious and would represent a significant increase in central resources deployed to support sponsored research activity.[§]

[§] Indirect cost recovery on external grants falls short of covering the true costs of supporting sponsored research activity. As documented in Appendix 2, the University provides a subsidy of approximately $33M/year in support of research infrastructure, and these top two recommendations would amount to an increase of the central subsidy to sponsored research of approximately 36 percent.

3.1.1 Faculty Research Funds

The Committee recommends raising funds to supplement existing resources in two categories: innovation funds and proposal-related funds. They are described in detail below.

Innovation funds are intended to address two negative consequences of the current uncertainties surrounding federal support for basic research in science and engineering: avoidance of risk-taking and increase in the time required to secure an investigator's first competitively-awarded grant. The former is a direct consequence of a hypercompetitive environment that discourages risk-taking and exploratory ideas in favor of "safe", routine proposals that tend to promise specific results, a direct contradiction of exploratory research. The latter problem is particularly serious in the life sciences[§]. The recommended funds also address an important challenge faced by mid-career faculty, for whom targeted "young investigator" opportunities are not available. In every case, the committee recommends that funds be awarded competitively, following annual calls for proposals, and rigorous anonymous peer review.

Proposal-related funds will provide substantial incentives aimed at encouraging Princeton faculty's continued robust engagement in the competition for federal and industrial funds, and at rewarding success in this activity.

Innovation funds. Will focus on the quality and promise of the individual and on the novelty of the ideas. Proposals will be short, typically 2-3 pages long, and will be expected to address bold, innovative and risk-taking concepts, rather than incremental advances. Funds will be made available to faculty members competitively, following anonymous peer review.

The two recommended funds are:

- *Scientific Innovator Fund:* for Assistant Professors.
- *Exceptional Accomplishment Fund:* for Associate and Full Professors, preferably in mid-career, with an established track record and a sustained focus on innovative thinking. Preference will be given to mid-career faculty.

Proposal preparation and matching funds. These funds will be awarded following a request for proposals and internal anonymous peer review. The two recommended funds are:

- *Proposal Preparation:* funds to assist with the preparation of proposals or the completion of experiments or calculations needed prior to submitting a proposal to a funding agency or industry.
- *Matching:* funds granted to faculty who secure competitive federal or industrial funds bearing full facilities and administrative (F&A) costs.

[§] The average age at which investigators receive their first NIH grant is now 42 (Alberts *et al.*, *Rescuing US biomedical research from its systemic flaws*, *PNAS*, *111*, 5773, 2013).

Indicative recommended amounts for each category of funds are listed in Table II.

Table II. Types of Faculty Research Funds Recommended by the Committee

	Duration	**Yearly Amount**
Innovation		
Early-career	4 years	$150K
Tenured	4 years	$150K
Proposal-related		
Preparation	1 year	$50K
Matching	3 years	$75K

By providing exceptional early-career and senior faculty with $600K over four years, innovation funds will enable Princeton faculty to engage in the kind of bold, risk-taking, exploratory research that is becoming increasingly rare in the current risk-averse, hypercompetitive environment. The Committee believes that a robust program of innovation funds will give Princeton a very substantial competitive advantage over its peers.

An additional benefit of the proposed programs involves the improved position of Princeton faculty to compete for external funding. Proposals submitted to NSF and NIH generally require a strong foundation of prior work that makes the proposed work both compelling and demonstrably feasible. New internal support for research will strengthen the proposals of Princeton faculty, increasing the likelihood of positive funding decisions, with the overall outcome of a virtuous cycle of more funds for research, enhanced research activity, and improved prospects for acquiring additional funding. Existing internal support for research at Princeton clearly bears this out. The Grand Challenges Program, for example, has supported research activities that have gone on to garner substantial external support, both governmental and foundation-based. Other examples of programs designed to enable bold and exploratory research that is not ready for forming the basis of competitive proposals submitted to funding agencies include the Eric and Wendy Schmidt Transformative Technology Fund, and Project X. The former supports the "invention, development and utilization of cutting-edge technology that has the capacity to transform research in the natural sciences and engineering." Project X supports "exploratory research that is not easily funded through traditional mechanisms," and is oriented "towards applied projects, rather than towards theory and/or basic research."

Proposal-related funds (preparation and matching) should also be awarded competitively. By facilitating research leading to proposal submission ($50K for one year) and rewarding investigators who receive competitively awarded federal or industrial grants ($75K/yr for 3 years), these two types of awards will leverage the impact of sponsored research and will provide substantial incentives for Princeton faculty to continue their already robust engagement in the competition for federal and industrial research funding.

Suggested Number of Awards. The Committee's suggestions for the number of yearly awards in each category is given in Appendix 2.

3.1.2 Graduate Student Support

Graduate students play an essential, irreplaceable role in science and engineering research, both at Princeton and at research universities worldwide. University research in science and engineering is an apprenticeship, where, broadly speaking, faculty members formulate research problems, provide critical feedback, train graduate students in the conduct of research, and guide the writing of papers, while graduate students carry out the actual experiments or calculations[¶], and, as they progress, learn to establish themselves as independent researchers. Graduate students play a critical role in establishing a vibrant intellectual culture in their home departments through their participation in seminars, workshops, etc. They are central to Princeton's teaching mission, through their work as teaching assistants. Last, but by no means least, graduate students are often essential participants in undergraduate research through their mentoring of seniors as the latter become integrated to a faculty member's research group during their senior thesis. In the course of such interactions, it is often the case that graduate students become role models for undergraduates considering careers in science or engineering. It is also important to remember that advising of graduate students is the most direct mechanism by which the Princeton faculty educates the next generation of scholars.

The combined effects of rising costs and shrinking purchasing power of research grants put this precious, essential resource of the science and engineering research enterprise at serious risk[§]. The Committee recognizes and greatly appreciates the very significant investments that Princeton already makes towards graduate student support, specifically in the form of first-year fellowships in Divisions III and IV. However, if Princeton wants to continue to attract stellar graduate students in numbers and of the quality that remain commensurate with its research enterprise as currently configured, it must make additional investments in graduate student support.

A New Graduate Student Support Mechanism. The Committee recommends the establishment of a fund to supplement sponsored research awards, so that grants can support more graduate students, thereby furthering both the research and educational missions of the University. The proposal would be for the fund to cover

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[¶] In Mathematics, graduate students work independently of faculty members.

[§] In 2004, the mean annualized award in NSF's Mathematical and Physical Sciences Directorate ($130K) enabled a Princeton faculty member to support 2.3 graduate students; in 2014 the corresponding number was 1.8. The corresponding numbers for the Engineering Directorate are $120K, 2.1 and 1.7.

the portion of tuition that is charged to grants for 4th and 5th-year graduate students supported on sponsored research funds[ﬂ]. One way to implement this is for these matching funds to flow to PIs as discretionary allocations, creating an incentive for faculty to seek external funding to support graduate students. An estimate of the required resources is given in Appendix 2.

3.2 Other Recommendations (Ranked in Order of Decreasing Priority)
The Committee identified the above two recommendations as the ones that would be most broadly impactful given the substantial investment required. That said, the Committee identified a number of additional very impactful mechanisms to support the research enterprise. Their ultimate scale and feasibility in some cases may depend on philanthropic interest in particular fields.

3.2.1 Graduate Student Fellowships
Supporting graduate students on fellowships rather than on grants is highly desirable because it provides financial stability to the student and the faculty advisor, protecting both from uncertainties in government funding. It also allows a far less constrained planning of research projects, by decoupling student support from the short cycle of a research grant. Several peer institutions have recognized the importance of graduate student fellowships, perhaps none more prominently than Stanford, which began a major fundraising effort in this direction during the presidency of Gerhard Casper (1992-2000). Today, the Stanford Graduate Fellowships in Science and Engineering provide 3 years of full support (tuition and stipend) to approximately 300 PhD candidates each year, on a competitive basis. Each year the Stanford Interdisciplinary Graduate Fellowships support approximately 75 PhD candidates engaged in interdisciplinary research. During its most recent campaign (2006-12), Stanford raised funds for more than 350 new graduate student fellowships.

The Committee recommends that Princeton undertake a long-term effort aimed at raising the funds to support a substantial number of graduate students involved in sponsored research activities on 3-year competitive fellowships (2nd, 3rd and 4th-year students).

3.2.2 Capital Equipment for Shared Facilities
State-of-the-art equipment is an essential component of science and engineering research. By its very definition, such equipment becomes rapidly obsolete, and must be replaced in order to keep up with the pace of scientific and technological development. High-performance computing provides a good example of the short lifetime of state-of-the-art scientific equipment, with hardware needing to be replaced approximately every three years[‡].

ﬂ Grant or award must bear full F&A costs.

‡ *The Future of Research Computing at Princeton.* White paper by J. Stone (June, 2015).

The absence of mechanisms that can provide stable funding for acquiring, maintaining and replacing capital equipment is consistently identified by the managers of shared facilities and principal investigators as one of the major challenges standing in the way of their ability to conduct or plan innovative, risk-taking, forward-looking research. Simply put, too much time is spent requesting contributions from stakeholders (e.g., users, departments) and writing major instrumentation proposals, rather than doing science.

As part of its work, the Committee sent a questionnaire to several departments and institutes with shared facilities (Chemistry, Molecular Biology, Physics, PICSciE and PRISM). The comprehensive responses provided detailed information on:

- capital equipment inventories (equipment itemization and dollar value)
- space utilization
- usage statistics (number of users per month, graduate/undergraduate and external/internal breakdown)
- policies for cost recovery (if any)
- Princeton's position relative to the competition

While maintenance costs are generally covered by user fees (or, in the case of PICSciE, by factoring typically 3 years of maintenance into capital costs at the time of purchase), none of the shared facilities surveyed has a stable funding source for major equipment purchases. The standard operating mode is to "pass the hat" and ask for central funds to cover any shortfalls.

The Committee recommends that Princeton raise funds for a central resource that would make available, on a competitive basis, funds for the purchase of capital equipment by academic units that manage shared facilities. Appendix 2 provides an estimate of the cost associated with this recommendation.

3.2.3 Allow Deferring First-Year External Fellowships

Under current policy, if a graduate student in Divisions III or IV has an external fellowship (e.g., NSF), his/her first-year support must come from this external fellowship. In other words, the awarding of an external fellowship relieves University support of the first year. This provision was factored into the cost model when Princeton generously decided to support all first-year graduate students in Divisions III and IV on University fellowships. The Committee recommends that to maximize the incentives for students and their advisors to apply for external fellowships, students be allowed to defer external first-year fellowships by one year.

3.2.4 Increase the Size of Corporate and Foundation Relations (CFR) Staff to a Level that is More in Line with Peer Institutions as a Means of Securing Additional Sources of Philanthropic and Industrial Funding in Support of Research

Although the Committee reaffirms the present model, in which government funding is the essential source of support for sponsored research, the importance of philanthropic and industrial funds, especially in times of constrained federal budgets and changing patterns of government support for research, should not be overlooked[‡]. Detailed peer benchmarking by the task force on "Finding new sources of funding" (see Introduction) revealed that Princeton lags significantly behind in terms of yearly corporate and foundation funds raised per faculty member: the 3-year average annualized figures (FYs 12-14) are $105.8K/faculty member at Stanford, $179K/faculty at MIT, and $24K/faculty at Princeton. In part this gap can be explained by the much smaller size of Princeton's CFR staff: 49 faculty members per frontline staff at MIT, 151 at Stanford, and 235 at Princeton. Accordingly, the Committee recommends increasing CFR staffing to levels comparable with those of peer institutions.

3.2.5 Proposal Development Resources

Currently Princeton has one person in the Dean for Research Office who devotes 50% of her time to proposal development support for faculty members on large or interdisciplinary proposals. The goal of proposal development services is to enhance the competitiveness of extramural funding proposals and enhance the capacity of individuals and teams to submit competitive proposals. Such services complement the existing, albeit limited, support available in some departments, centers, and research institutes. A few of Princeton's centers have a staff position to contribute to management of the research programs, a job which occasionally includes proposal development support for renewals and other funding opportunities relevant to the centers (e.g., PRISM and Office of Population Research). A few departments have tested the concept of hiring technical grant writers to facilitate individual PI proposals with mixed results (e.g., Chemistry and Molecular Biology). These departments reported that some faculty members were reluctant to collaborate with a grant writer on proposals, while others felt that the writer improved the overall quality of the submission. Large center or interdisciplinary funding opportunities require much more than a compelling technical proposal, which constitutes the bulk of an individual proposal. These funding programs can call for detailed plans on research management, outreach, diversity documentation, technology transfer, etc., as well as assessment documentation far exceeding what is required for individual investigator proposals. Proposal development services can add considerable value with this aspect of the work.

After surveying the peer landscape, the Committee recommends that two full-time proposal development positions be created within the Dean for Research Office. The services provided by proposal development personnel would include proactive identification of large-scale, collaborative funding opportunities at federal funding agencies; identifying and building collaborative teams; project-management support for the proposal process; strategic review and proposal editing; and development of non-technical components of proposals, including outreach activities, shared facilities and data management plans.

[‡] In FY13, 5.5% of campus research expenditures were sponsored by industry and 6.9% were sponsored by foundations.

3.2.6 Reducing the Administrative Burden on Investigators

In recent years, concern about the increasing administrative burden on investigators who conduct federally-funded research has become widespread. Numerous high-level committees have been formed[¶] and reports written aimed at reviewing regulations that "either hinder the conduct of research or that are costly to research universities but provide little public benefit"[‡], and to finding a solution to the increased time and effort that investigators need to devote to satisfying compliance requirements. Through its Office of Government Affairs, Princeton is actively involved in trying to address this problem at the national level.

The University has made major and welcome investments in the compliance area, as illustrated, for example, by the creation of the Office of Research Integrity and Assurance. Recent accreditation visits[§] and inspections[€] illustrate Princeton's overall very strong position with respect to compliance. The Committee applauds the University for its commitment to a culture of compliance and the substantial investments it has made in this area. Without in any way detracting from this commitment to research compliance, the Committee recommends the formation of a task force charged with undertaking a comprehensive review of the administrative infrastructure that supports sponsored research and identifying inefficiencies, redundancies, and internal procedural hurdles that add unnecessarily to investigators' administrative burden and interfere with their ability to conduct research. The goal is to be fully compliant, but to do so as efficiently as possible, and factoring in an awareness of the administrative burden whenever new procedures are implemented.

The Committee believes that enabling research and ensuring full regulatory compliance should be complementary and mutually reinforcing activities.

3.2.7 Create a Culture that Encourages 1st-year Graduate Students to Apply for External Fellowships

Princeton's current policy is to provide a $4K/yr supplement, funded by the Graduate School, to any graduate student in Divisions III or IV who is a recipient of an external fellowship, so long as the associated stipend exceeds the 10-month Assistant in Research (AR) rate. There is no financial incentive for a student to apply for external fellowships whose stipend is less than the 10-month AR rate. During its

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¶ Task Force on Government Regulation of Higher Education; National Research Council Board on Higher Education and Workforce; National Research Council Committee on Science, Technology and Law; National Science Board Report NSB/AB-14/3; FY 2014 Omnibus NIH Requirement; Government Accountability Office Review of Research University Regulations; Legislation on Reforming Research Related Regulations. Source: American Association of Universities.

‡ *Reducing Investigators' Administrative Workload for Federally Funded Research.* National Science Board (2014). Report NSB/AB-14/3.

§ Association for Assessment and Accreditation of Laboratory Animal Care International visit in March, 2015. Recommendation of full accreditation, endorsed by AAALAC Council in May, 2015.

€ National Science Foundation Office of Inspector General highly favorable review of Princeton's Responsible Conduct of Research program, February 2015.

deliberations, the Committee examined the practices of various departments regarding external fellowship applications. In Molecular Biology (MOL), the culture is such that *all* eligible first-year graduate students are *expected* to apply for an external fellowship. This, however, is the exception.

The Committee recommends that the Dean of the Graduate School engage in conversations with all Directors of Graduate Studies (DGS) and Department Chairs in Divisions III and IV, aimed at establishing a culture in which all eligible first-year graduate students apply for external fellowships. Of course, establishing such a culture also requires that proper incentives be put in place. The Committee is not prepared at this stage to make specific recommendations on financial incentives (e.g., Graduate School/Department/advisor contributions), due in part to the broad range of fellowship opportunities, departmental cultures, and financial situations. Nevertheless, the Committee recommends that the Dean of the Graduate School lead a conversation with Division III and IV DGSs aimed at formulating guidelines for encouraging eligible 1st-year graduate students to apply for external fellowships and rewarding those who are successful.

4. RESPONSES TO A WORST-CASE GOVERNMENT FUNDING SCENARIO

In aiming to provide a balanced perspective on its recommendations, the Committee sought to better understand the various budgetary pressure points surrounding sponsored research. Specifically, it solicited input on the range of actions that would be implemented at Princeton science and engineering departments in response to a worst-case scenario. Understanding how academic departments would respond to a hypothetical "perfect storm" of declining federal support for research, and other philanthropic and budgetary contractions helps to provide an envelope of responses that places the aspirational (yet, we believe, realistic) outlook underlying several of the Committee's recommendations in a fuller context.

The worst-case scenario considered by the Committee consisted of an 8% decrease in sponsored research volume as a result of federal budget cuts. Chairs in the departments of Astrophysical Sciences, Mechanical and Aerospace Engineering, Molecular Biology and Physics were asked to answer specific questions about their response to permanent cuts of this magnitude, with no compensating additional sources of funds. To put the likelihood of cuts of this magnitude in proper perspective, it should be mentioned that the President's FY16 budget request includes an 8% cut in Department of Defense basic research[¶].

The responses were remarkably consistent. The four departments indicated that three core areas should be preserved:

[¶] Currently, approximately 20% of Princeton's government-funded research expenditures fall under the DOD basic research category, amounting to ca. $33M/year.

- *The size of the faculty* (number of FTEs). The four departments cited the risk of becoming "sub-critical" relative to the larger departments with whom they compete (e.g., Harvard for AST) as the justification for this recommendation.
- *The size of the graduate program* (number of graduate students). The four departments cited graduate students as an essential component of their research programs, and the significant risk of competitive disadvantage relative to larger peer departments (e.g., Stanford, MIT for MAE) as the justification for this recommendation[§].
- *The size of start-up packages.* This recommendation is closely tied to maintaining the size and of the faculty, since non-competitive start-up packages inevitably hinder the ability to attract top faculty talent.

Faced with a worst-case scenario, the four queried departments were also consistent in the areas identified for cuts: the number of post-docs and of research staff members. The former would be a self-regulating response, since post-docs are hired by individual faculty and supported by sponsored research funds. Should the worst-case scenario be long-lasting, experimental programs may suffer at the expense of theory.

In sum, two conclusions emerge from this exercise:

- The Committee has given serious thought to possible reactions to a worst-case scenario for government support for research. Should such major budget cuts occur, there would be serious consequences for the backbone of Princeton's science and engineering research. Given the quality of Princeton's contribution to advancing the frontiers of knowledge, the negative consequences of the worst-case scenario would no doubt be felt well beyond the confines of our campus.
- The core activities that the four queried departments consistently identified as "irreducible" (size of the faculty, size of the graduate program, size of start-up packages) are fully consistent with the Committee's major recommendations.

[§] Two of the four departments queried have voluntarily reduced the size of their incoming graduate student cohort in response to uncertainties in government funding. Their response indicates that no further reduction is possible.

Appendix 1

First Report of the Committee on Sponsored Research

First Report of the Committee on Sponsored Research

Summary of Data Collected by the Committee During the Spring of AY 13-14, and Preliminary Conclusions Emerging from the Data

October 24, 2014

Committee members
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Daniel M. Sigman (GEO)
David N. Spergel (AST)
Annette Tate, *Department Manager, Office of the Dean for Research* (Secretary)

Sitting with the committee
Karla Ewalt, *Associate Dean for Research*
Steven Gill, *Budget Director and Associate Provost for Finance*
Jed Marsh, *Vice Provost for Institutional Research*

1. Introduction

Since the end of World War II, federal support for basic research in science and engineering has been the foundation of the spectacularly successful U.S. research enterprise. Basic research has vastly extended the realm of human knowledge, and has been a major driving force behind technological progress, and hence economic well-being and social mobility.

Although federal support for research in science and engineering remains broadly popular† [1], a confluence of factors now challenges some of the basic assumptions on which the federally-funded scientific research model has been based. These factors include, importantly, a fundamental philosophical disagreement between the two major political parties regarding the proper role of government in a democratic society. Such disagreements can only be resolved through vigorous debate and the unpredictable, often messy, but ultimately legitimizing democratic process. In the meantime, sequestration and government shutdowns are but the most visible consequences of this political stalemate, which is having adverse effects on the research enterprise. Adding to the resulting current uncertainty are concerns, particularly acute in fiscally austere times, about the financial sustainability and wisdom of supporting basic research, with its long-term horizons, uncertain payoff, and inherently ambiguous "appropriability"‡ [2].

The Committee on Sponsored Research was constituted in order to identify the responses that Princeton ought to undertake in light of changing patterns of government support for research, so as to maintain and enhance its stature as one of the world's leading research universities. The committee met seven times during the spring semester of the academic year 2013-14. It gathered national data on government support for research, funding agency budgets, proposal success rates, and mean award amounts. The committee also collected campus data on sponsored research expenditures, proposal success rates, and funding levels across departments. Peer comparisons of the costs of supporting graduate students on sponsored research contracts and of policies governing tuition charges were also conducted. This report summarizes the most important data collected by the committee and the main conclusions emerging from the analysis of the data.

2. The National Picture

In 2011, total research and development (R&D) expenditures in the US amounted to 2.85% of gross domestic product (GDP) [2, 3]¶. **Figure 1** shows historical data for federal and non-federal expenditures in academic science and engineering R&D, as a percentage of GDP, and **Figure 2** shows the evolution of the relative contributions (federal, academic institutions, state and local government, industry) to academic science and engineering R&D. One notable trend is the increase in the relative contribution from academic institutions, from 12% in 1972 to 19% in 2012. During the same period, the federal contribution decreased from 68 to 62%. Most of this change in the ratio of federal to institutional contributions happened before the early '90s.

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† E.g., in 2012, "83% of Americans 'agreed' or 'strongly agreed' that 'even if it brings no immediate benefits, scientific research that advances the frontiers of knowledge is necessary and should be supported by the federal government.'" [1]

‡ "How well do the rewards flow back to the investor who actually takes the risk and puts up the money?" [2]

¶ This percentage has fluctuated between ca. 2.2 and 2.8% since the 1960s [2]. In 2011 the US ranked 9th by this measure of R&D expenditure intensity, behind Israel (4.38%), South Korea (4.03%), Finland (3.78%), Japan (3.39%), Sweden (3.37%), Denmark (3.09%), Germany (2.88%) and Switzerland (2.87%) [3].

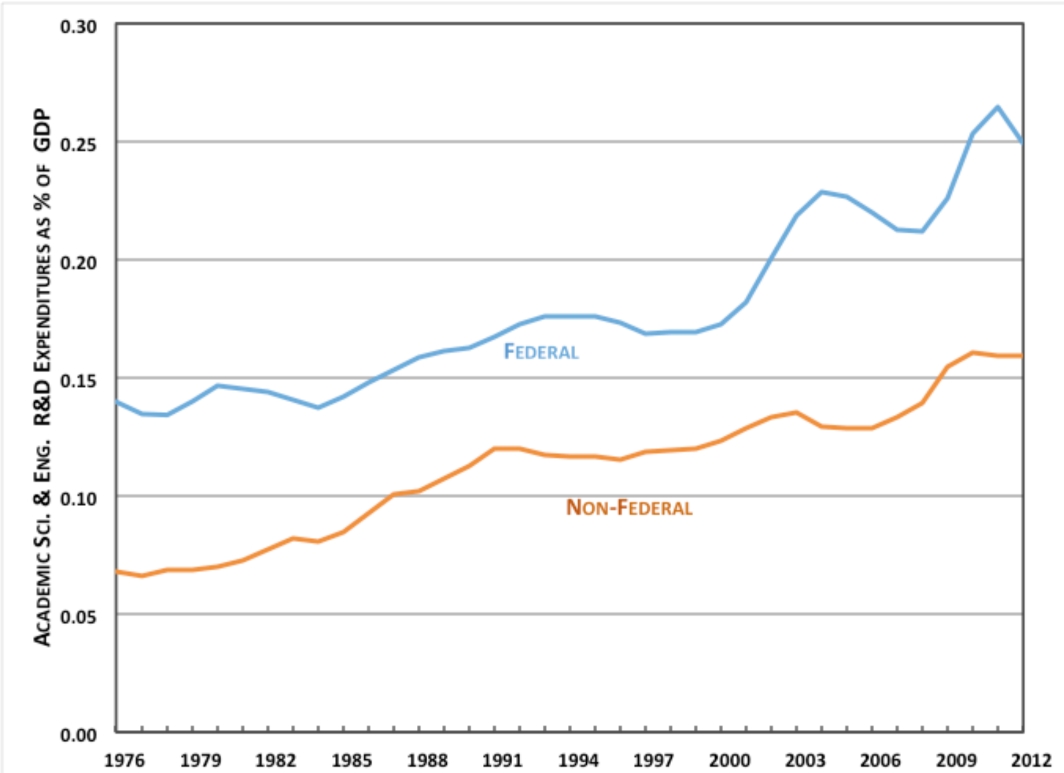


Figure 1: Federal and non-federal expenditures in U.S. science and engineering academic R&D, as % of GDP [4, 5].

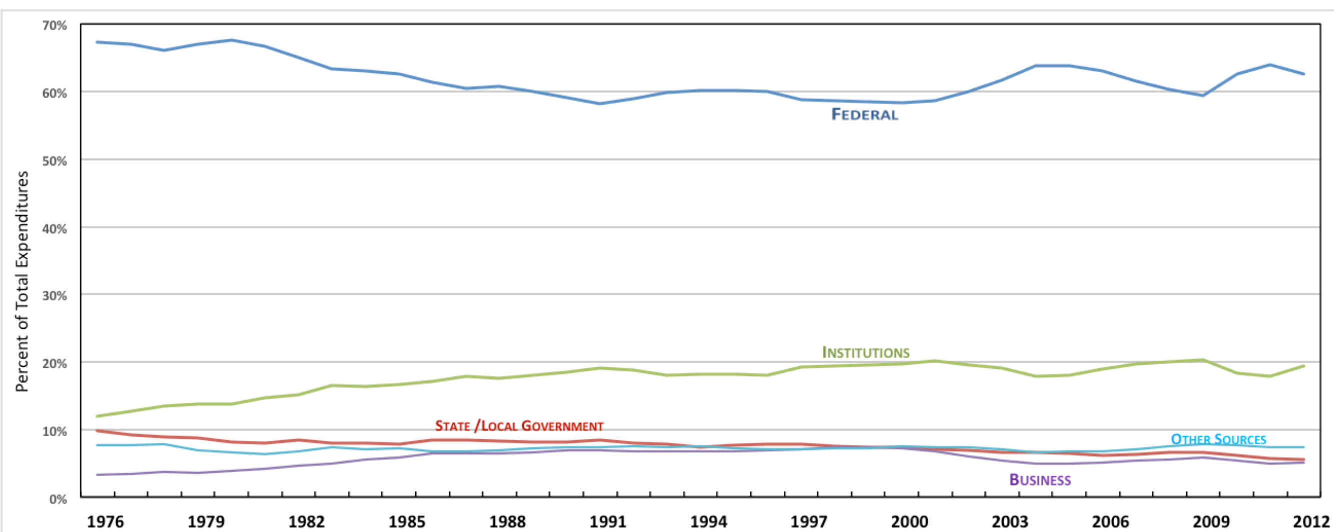


Figure 2: Percent contributions to expenditures in U.S. science and engineering academic R&D [4].

Figures 3 and 4 show the R&D allocation (administrative and building expenses not included) to the main science and engineering funding agencies, in constant (2014) and nominal dollars‡ [6].

‡ DOD data include only basic research (6.1).

Between 2005 and 2013, the constant-dollar R&D allocation to NIH and NASA *decreased* by 13 and 11%, respectively. The R&D allocation to DOD (6.1 basic research), DOE and NSF, on the other hand, increased by 10, 7 and 12%, respectively.

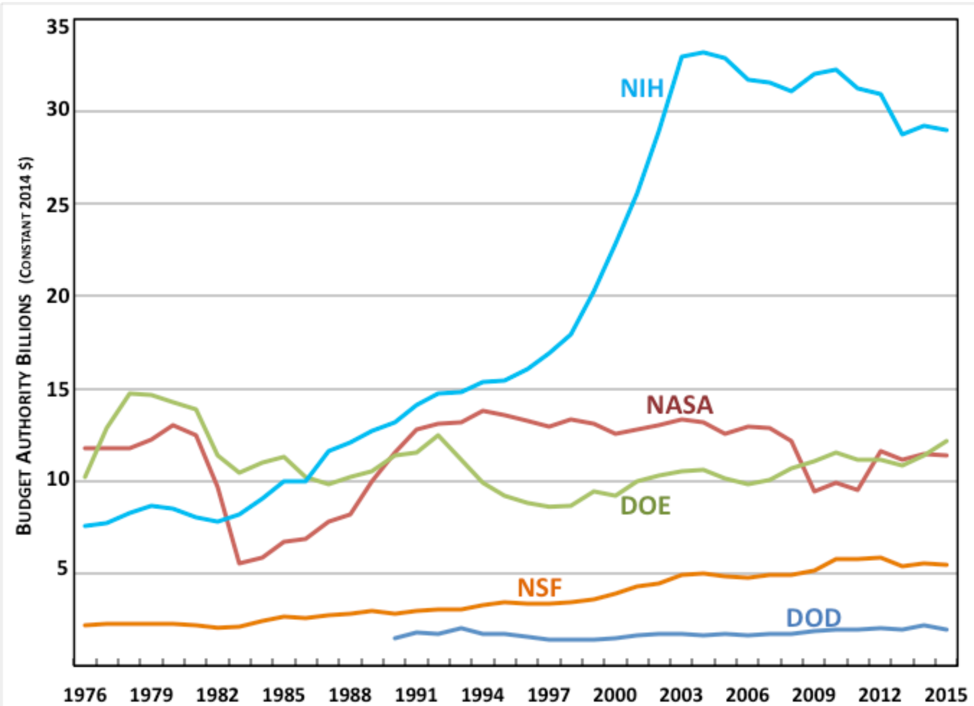


Figure 3: Budget allocation to principal science and engineering funding agencies, in constant (2014) dollars. Administrative and building allocations not included [6].

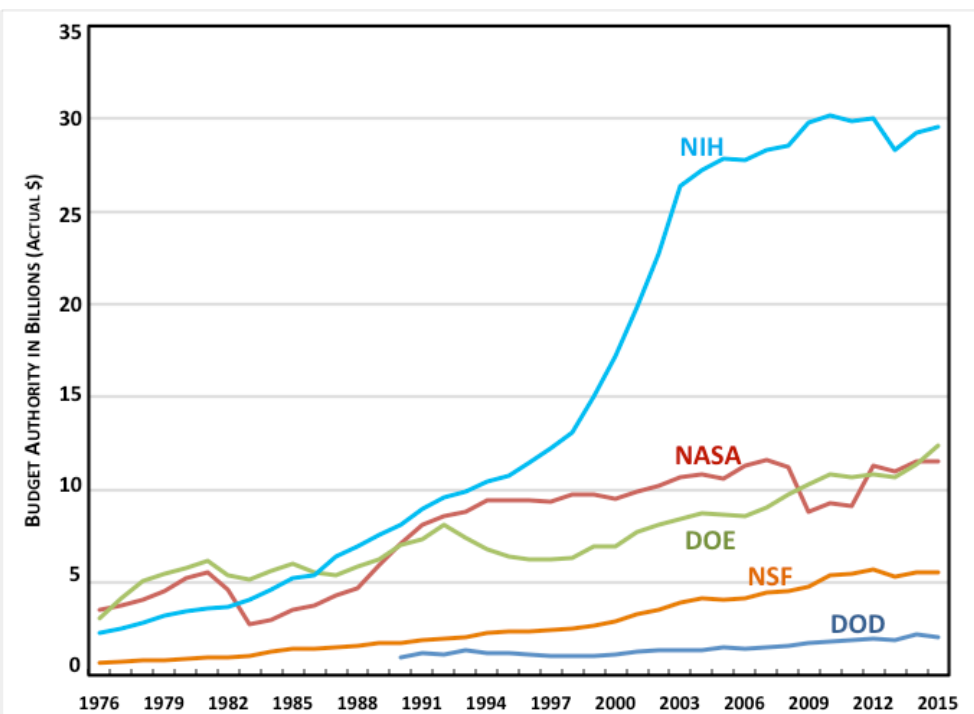


Figure 4: Budget allocation to principal science and engineering funding agencies, in nominal dollars. Administrative and building allocations not included [6].

Because 62% of Princeton's federally funded research corresponds to NSF (35%) and NIH (27%) awards[¶] (see **Figure 10** below), in what follows we focus on these two agencies.

Figure 5 shows historical data on proposal submissions and the corresponding success rate at NIH [7]. Since 1970, applications have increased more than 5-fold (9,199 in 1970 vs 49,581 in 2013). However, the number of awards has not kept up with this trend. As a result, the success rate has dropped from 35.5% in 1970 to 16.8% in 2013. This change has been especially dramatic in the last ~ 10 years, with the rate dropping from 32.1% in 2001 to 16.8% in 2013. , with the rate dropping from **Figure 6** shows historical data on proposal submissions and the corresponding success rate at NSF [8]. The decrease in success rate has been less pronounced at NSF compared to NIH. A significant drop, from 30 to 21%, occurred between 2000 and 2004, and the numbers appear to have stabilized since then[]. In recent years, NSF has instituted limited proposal submission windows (e.g. in the Chemistry division, either 9/1 to 9/30 or 10/1 to 10/31, depending on the specific program). This policy severely limits the number of proposals that a principal investigator (PI) can submit in any given year, and thereby adds a significant barrier to researchers' ability to secure funding.

Figure 7 shows NIH research project grant average size over the last 14 years, in nominal and constant (1999) dollars [9]. In 2013, the average grant size in constant dollars was 16% *smaller* than in 2004. This is especially telling in light of the simultaneous increase in graduate student costs (see below, Figure 12). **Figure 8** shows mean and median annualized NSF award amounts [10]. It can be seen that the mean annualized award size in constant dollars has remained relatively steady during the last decade. As will be discussed below, graduate student costs have increased significantly during the same period.

The picture that emerges from the data is one in which the federal government's fractional contribution to the academic scientific research enterprise has steadily decreased over the past 40 years (Figure 2). Funding agencies' budget allocations in constant dollars have either decreased, remained flat, or at best experienced modest growth for the last decade (Figure 3). Overall proposal success rates at NIH have almost halved since 2001 (Figure 5), while the average grant size actually decreased during the same period (Figure 7). NSF likewise has experienced a decrease in proposal success rates[] (Figure 6), though not as pronounced as NIH's, while the average grant size has remained approximately constant during the last ten years (Figure 8).

[¶] The precise numbers vary yearly, but NSF's and NIH's combined share of Princeton's government-sponsored expenditures has added up to ca. 65% for the past few years.

[] It should be noted that some NSF divisions (e.g., BIO) require pre-proposals, which are not factored in in Figure 6. Thus, the success rates would be lower if pre-proposals were counted.

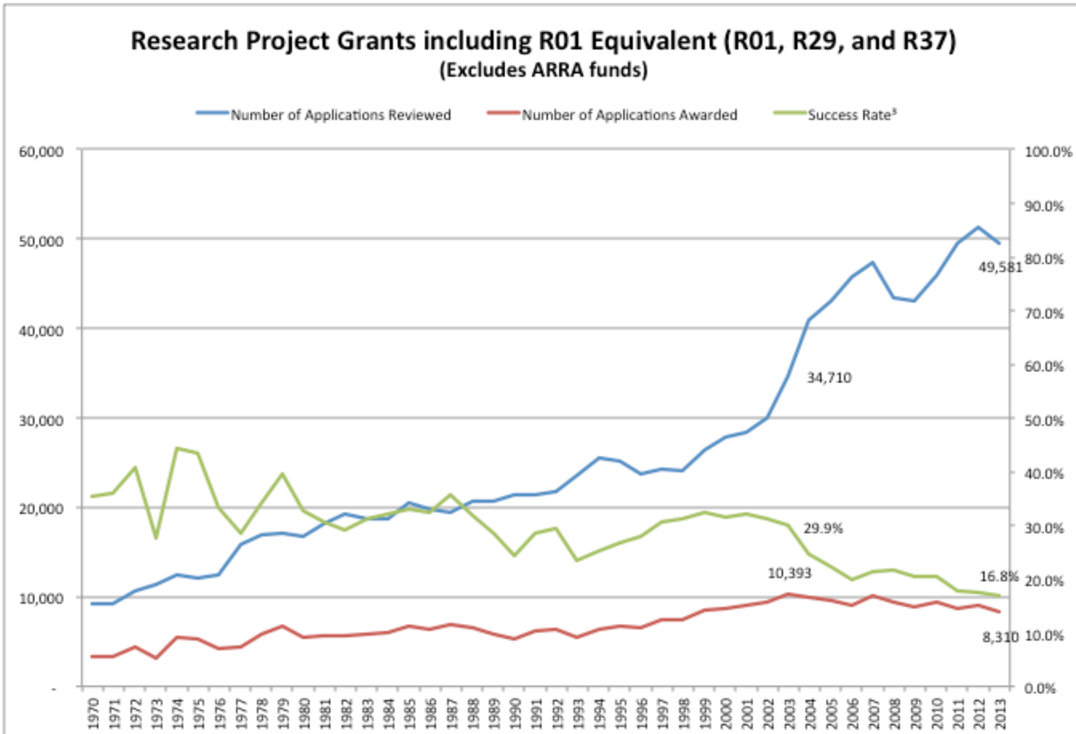


Figure 5: NIH proposal submissions and success rates since 1970 [7].

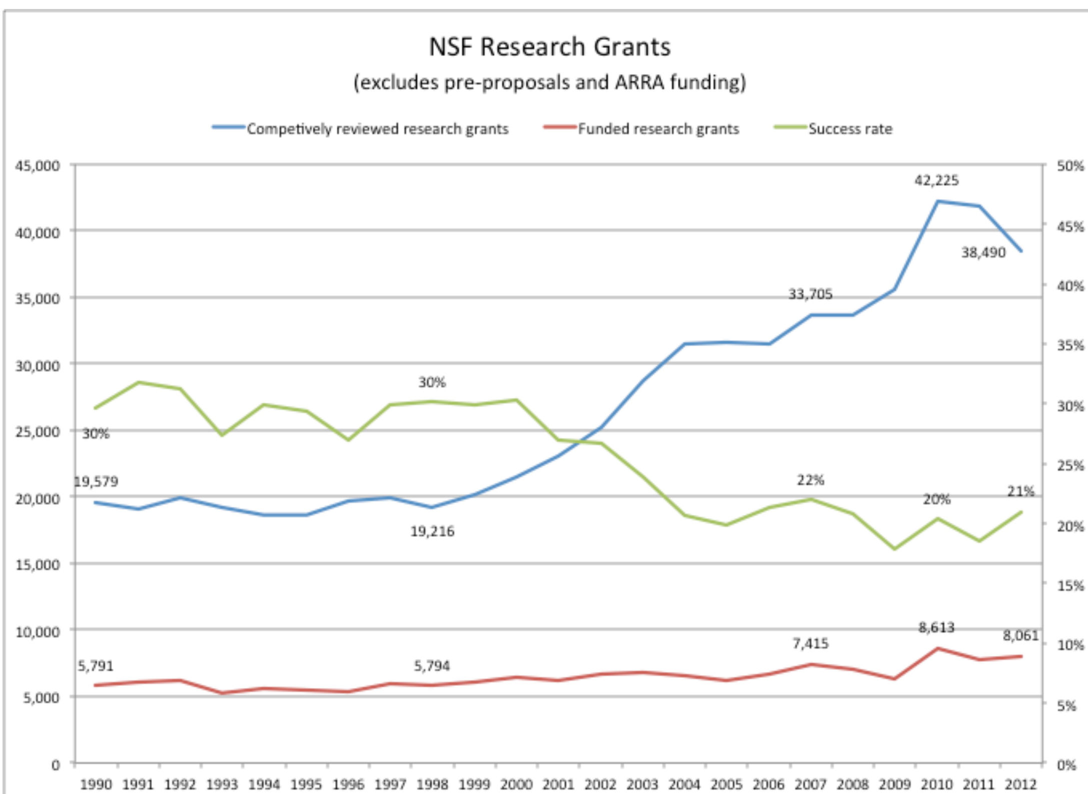


Figure 6: NSF proposal submissions and success rates since 1990 [8].

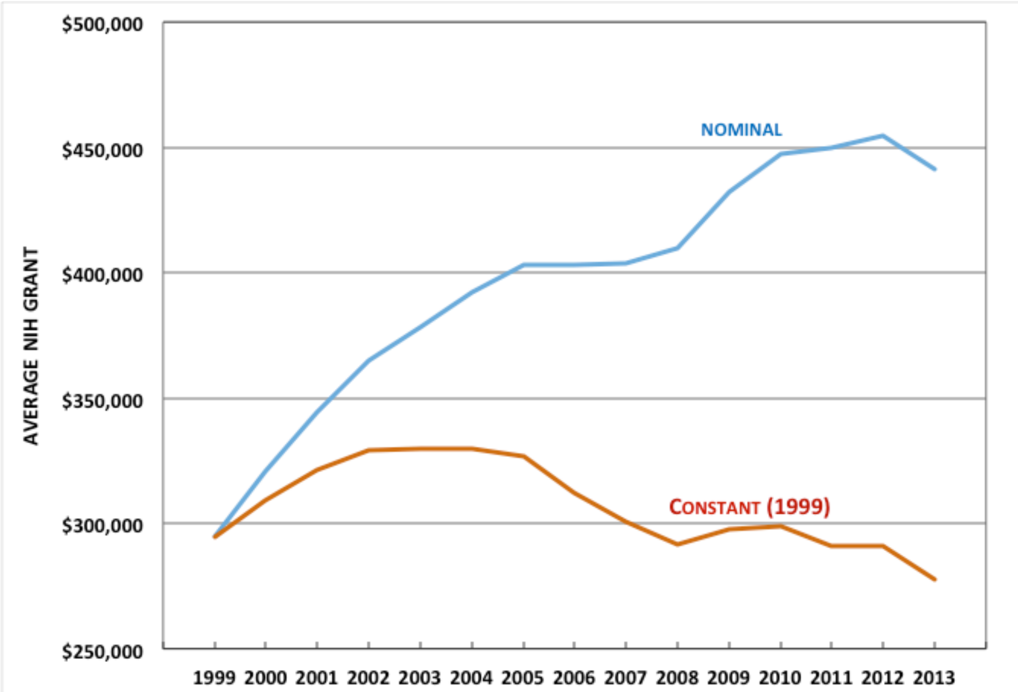


Figure 7: Average size of an NIH grant in nominal and constant (1999) dollars [9].

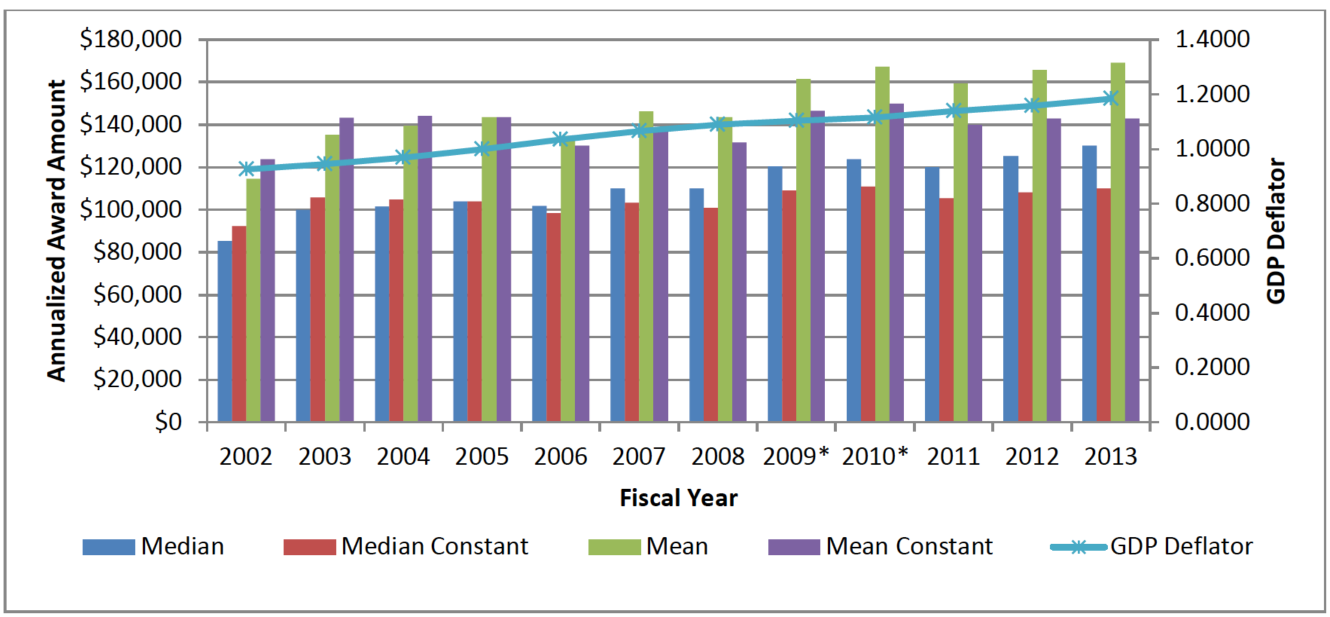
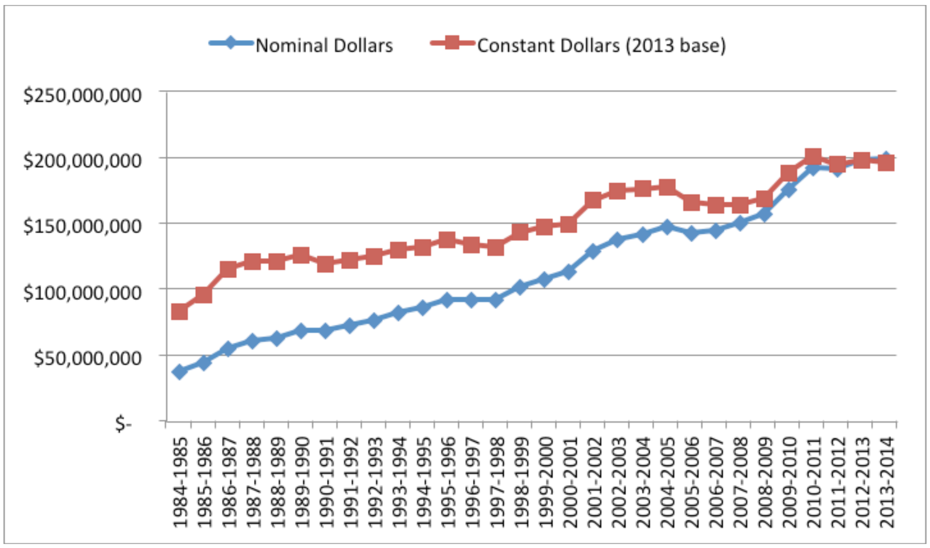


Figure 8: Annualized NSF award amounts in nominal and constant (2005) dollars [10].

3. The Campus Picture

Figure 9 shows the evolution of campus and PPPL research expenditures over the past 30 years. In constant (2013) dollars, the former has more than doubled, whereas the latter has shrunk almost by a factor of 5[§]. Sources of funding for campus research during FY13 are shown in **Figure 10**. It can be seen that the federal government provides 85% of research funds, of which 62% correspond to NSF- or NIH-sponsored projects. NIH's share of government-sponsored expenditures in FY13 (26.6%) continues a 5-year downward trend (NIH's share of Princeton's government-sponsored expenditures was 35, 34, 32 and 31% in FY 09, 10, 11, 12, respectively).



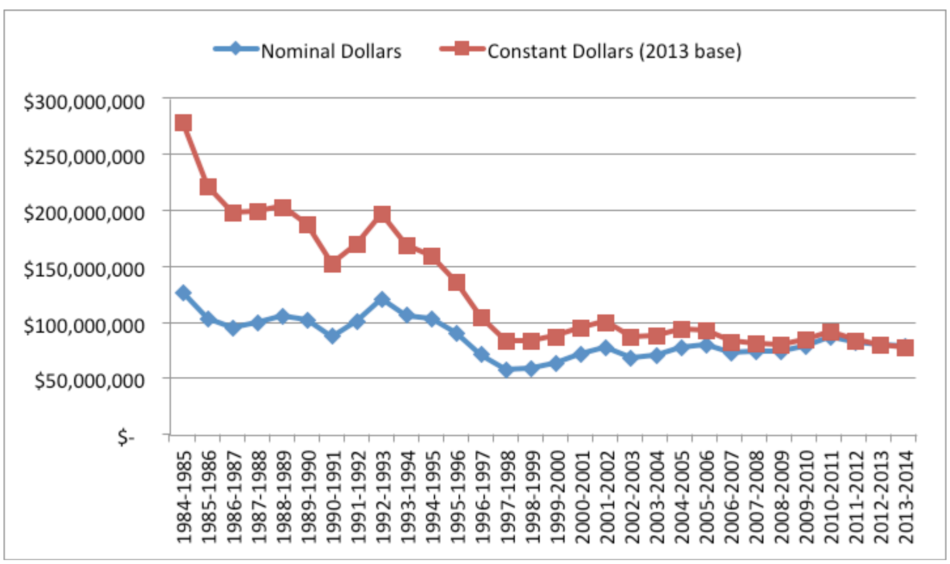


Figure 9: 30-year history of yearly sponsored research expenditures in nominal and constant dollars. Top: campus; bottom: Princeton Plasma Physics Laboratory.

§ The Tokamak Fusion Test Reactor (TFTR) began operation in FY 1983 and ended in FY 1997.

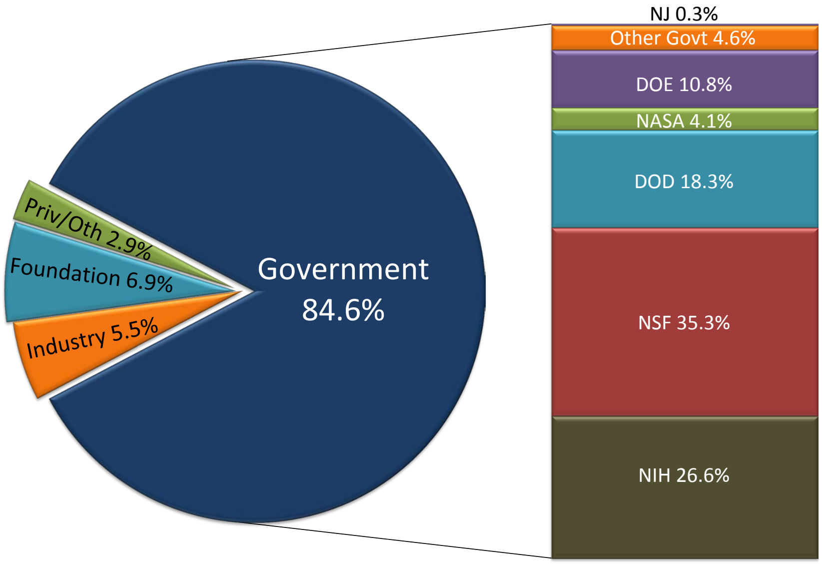


Figure 10: Distribution of Princeton's research expenditures in FY13, by sponsor (PPPL not included).

Appendix A.1 shows the proposal success rate for every department and program, between 1999 and 2013†. By this important measure, the University continues to do well in spite of the national trends, especially as they concern the NIH (see Figures 3-5 and 7). While the data do show significant fluctuations, it is telling that departments such as Molecular Biology have not experienced anything like the pronounced national decline in proposal success rates (Figure 5). The Committee does not mean to imply that external stresses are not affecting Princeton's research enterprise. In fact, as will be documented below, some of these stresses are already starting to have consequences on campus. Nevertheless, it is important to point out that the very high quality of the Princeton faculty has so far largely isolated the campus research enterprise from some of the most drastic consequences of the current uncertainty in federal funding.

Appendices A.2 and A.3 show yearly new award dollars between 1999 and 2013, on an absolute and per-faculty basis, respectively¶. Appendices A.1-A.3 paint a consistent picture in which proposal success rates and new awards are, so far, indicative of resilience to some external factors, driven largely by the quality of Princeton's faculty.

Figure 11 compares federally funded research expenditures per PI for Princeton and several peer institutions [11]. It can be seen that Princeton faculty are doing very well, securing federal funds at a level that is comparable to that at the nation's other top research universities.

† Proposals assigned to the submitting unit.

¶ Awards were divided equally among participating departments (e.g., an award with three co-PIs, each in a different department, was divided equally among these departments for the purpose of generating Tables 2 and 3.)

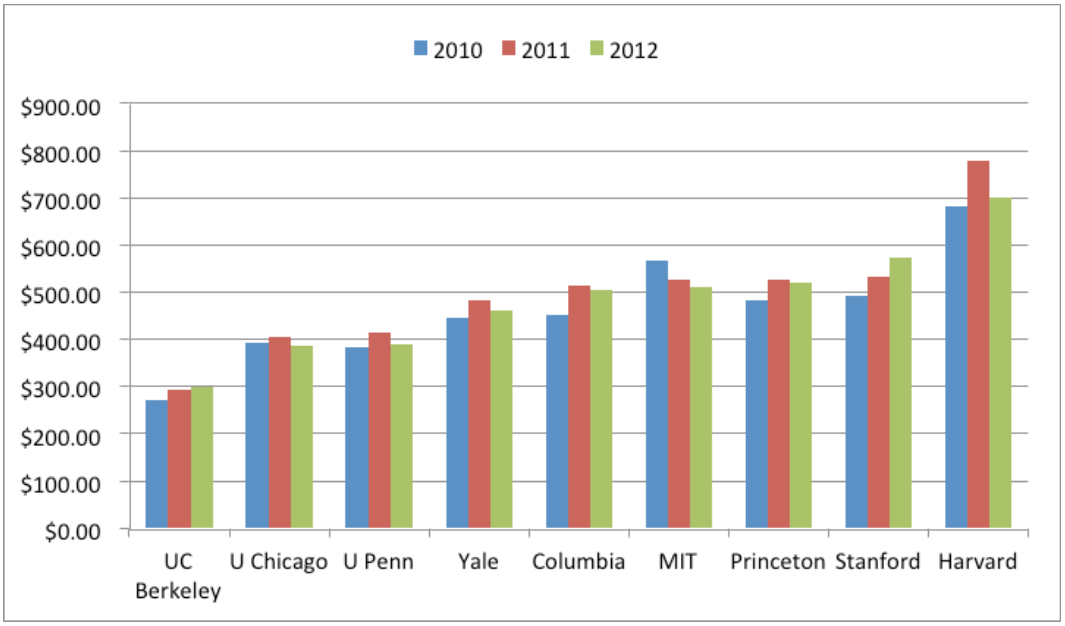


Figure 11: Federally funded research expenditures per PI at Princeton and several peer institutions [11].

Figure 12 shows the evolution of the cost (in constant and nominal dollars) of supporting a Princeton graduate student on research grants, since 1996. In 18 years this cost has increased by 35 and 91% in constant and actual dollars, respectively. This should be contrasted with the concurrent decrease and modest increase, respectively, in the average NIH and NSF grant sizes (Figures 7 and 8). This erosion of a research grant's "buying power" is one of the major challenges facing faculty today. It implies devoting increasing amounts of faculty time to writing proposals, or an eventual reduction in the overall size and scope of Princeton's research enterprise. In some departments, such as Molecular Biology, this is already starting to happen, as several faculty members are cutting the size of their research groups [12].

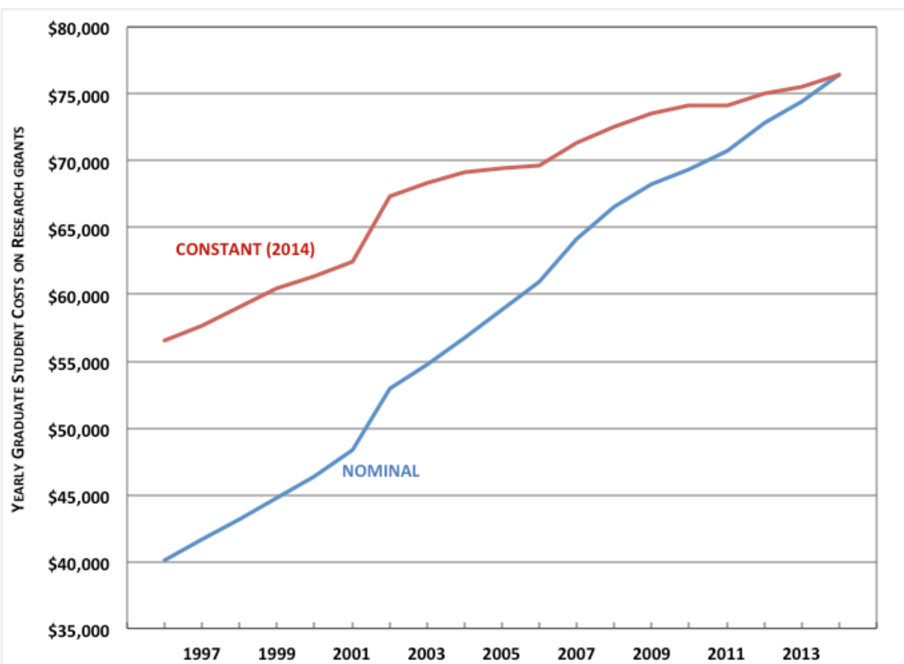


Figure 12: Yearly costs of supporting a graduate student on sponsored research grants at Princeton, in constant (2014) and nominal dollars.

The committee also looked at graduate student support costs across peer institutions. Specifically, **Figure 13** [13] shows the cost breakdown of supporting a graduate student on research contracts at Princeton and across several peer institutions.

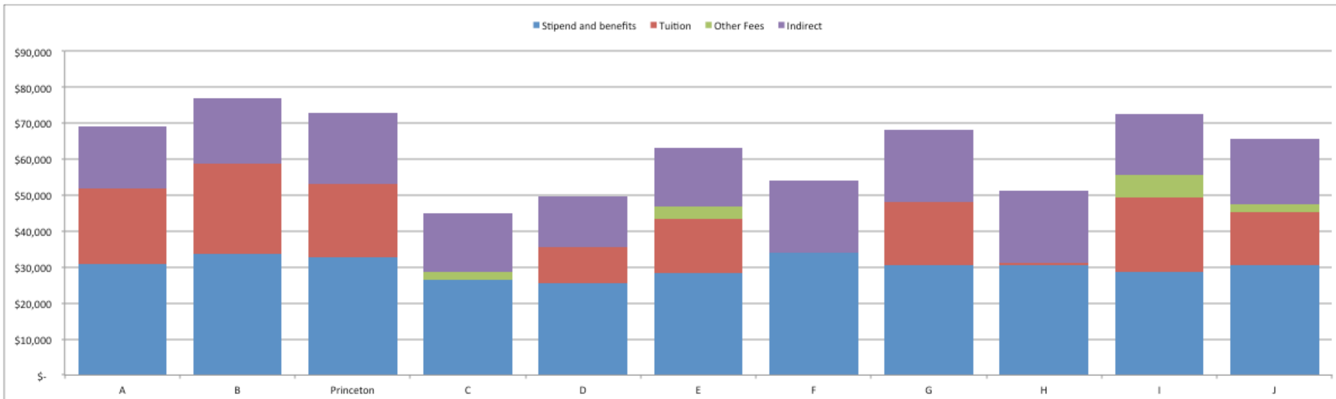


Figure 13: Comparison of annual costs of supporting a graduate student on research grants across several peer institutions. Data are for AY 12-13 [13].

Table 1 compares the graduate student tuition policies at Princeton and several peer institutions[§]. While Princeton's yearly graduate student support costs fall somewhat on the high side, charging half tuition through the end of the fifth year is the standard policy across the majority of peer institutions. Columbia, which fully covers the first two years of support to science students, and Princeton, which provides first-year fellowships to all science and engineering graduate students, are the only institutions that currently provide this type of across-the-board support lasting one or more years.

Table 1: Comparison of graduate student tuition charging policies at peer institutions[a].

Year	**1**	**2**	**3**	**4**	**5**
Columbia[b]	0	0	0.5	0.5	0.5
Cornell	0.5	0.5	0.5	0.5	0.5
MIT	0.5	0.5	0.5	0.5	0.5
Penn (eng.)	0.5	0.5	0.5	0.5	0.5
Princeton[c]	0	0.5	0.5	0.5	0.5
Yale	0.5	0.5	0.5	0.5	0

[a] Numbers give the fraction of graduate student tuition charged to grants each year.
[b] Graduate students in the Sciences.
[c] Academic year stipend and tuition for all first-year graduate students in the sciences and engineering (Divisions III and IV) is covered by the university. In Astrophysical Sciences, the department, rather than the university, provides this support.

While Table 1 is relevant to most Division III and IV departments, Molecular Biology also competes for faculty and graduate students with top medical schools. While the committee did not collect systematic data on medical school policies for supporting graduate students, we note that in some cases schools cover most graduate student costs. Harvard's Division of Medical Sciences

[§] These are institutions from which the Graduate School and the Office of the Dean for Research have been able to obtain information in response to personal inquiries.

(DMS), for example, covers stipend, full tuition and fees of all 1st and 2nd-year graduate students; the faculty advisor pays stipend and fees for 3rd and 4th-year students, whose reduced tuition is covered by DMS; and 5th-year students and above are supported by the advisor (stipend, fees, no tuition charged). It is also worth noting that the University of California at San Francisco recently raised $30M, matching them with $25M of institutional funds and a commitment to raise another $5M, in support of bioscience graduate student tuition and stipend. Of course, medical schools are organized according to very different principles and practices than Princeton (e.g., most medical school faculty members do minimal teaching, and they have to raise their salaries from grants). Nevertheless, they can pose competitive pressures for some Princeton departments, such as Molecular Biology.

In sum, thanks to the exceptional quality of the faculty, Princeton has been able to sustain an excellent overall record of proposal success rate and of research dollars raised per faculty member. Nevertheless, the diminishing or at best flat purchasing power of most federal research grants, the increasing costs of supporting graduate students on research contracts, and the prospect of further decline in proposal success rates at the major funding agencies (NIH, NSF) raise questions about the long-term sustainability of the campus research enterprise as currently configured.

The above assessment is based on the data collected by the committee and summarized in this report. The campus numbers notwithstanding, several committee members spoke of a significant anxiety among the faculty, associated with research funding. The committee takes this seriously, and will assess the pervasiveness and causes of this reported faculty sense of anxiety. The success of Princeton's research enterprise depends in no small part on creating conditions where faculty can thrive. Widespread anxiety such as has been suggested to exist, if confirmed, would be an obstacle standing in the way of research of the highest quality.

4. Next Steps

This report summarizes the data collected by the Committee on the Future of Sponsored Research during the spring semester of academic year 2013-14, and the preliminary conclusions emerging from the data. During the fall of academic year 2014-15 the committee will make recommendations on the responses that Princeton ought to undertake so as to maintain and enhance its stature as one of the world's preeminent research universities in light of changing patterns of government support for research. The committee will address three broad questions:

Identifying scenarios*: Taking as given the range of reasonable projections for future trends in federal funding, and assuming no other sources of external funding, what should Princeton's best response to these conditions be, and what are the likely impacts on campus research activities?*

Finding new sources of funding*: What are new sources of corporate, philanthropic and international funding for research, and what are the considerations that should be made in deciding whether to attract them? How might Princeton attract them?*

Internal mechanisms for enhancing Princeton's research enterprise*: How can existing or new resources be optimally deployed in support of Princeton's research enterprise?*

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    NSF Higher Education R&D (HERD) Survey http://www.nsf.gov/statistics/srvyherd/#tabs-1
12. Summer 2014 presentation by MOL chair and department manager to dean for research.
13. Institutional research peer survey (2013).

Appendix A.1

Proposal Success Rates by Department, 1999-2013¶

¶ Data current as of 4/30/14

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		*Success Rate %*
Natural Sciences	**7323**	**$4,348,916**	**3273**	**$1,481,009**	**3496**	**$2,239,045**	**305**	**$231,283**	**247**	**$179,885**	***46.25%***
Applied and Computational Math	168	121,832	86	37,675	75	79,837	3	1,212	4	578	*52.44%*
1999	4	333	3	311	1	22					*75.00%*
2000	6	1,516	5	1,213					1	86	*100.00%*
2001	8	3,062	3	535	5	1,593					*37.50%*
2002	5	15,698	3	260	2	15,434					*60.00%*
2003	6	2,083	2	410	4	1,653					*33.33%*
2004	11	4,554	7	1,358	4	2,640					*63.64%*
2005	21	13,510	9	2,785	12	11,076					*42.86%*
2006	12	4,616	5	1,407	6	3,197			1	12	*45.45%*
2007	16	13,014	7	2,038	8	10,796			1	180	*46.67%*
2008	13	13,674	6	2,503	7	10,416					*46.15%*
2009	24	21,740	12	14,054	11	7,461			1	300	*52.17%*
2010	17	8,130	9	3,654	8	4,150					*52.94%*
2011	9	8,782	5	3,272	4	5,320					*55.56%*
2012	7	8,337	3	1,653	2	5,514	2	1,170			*42.86%*
2013	9	2,784	7	2,222	1	565	1	42			*77.78%*
Astrophysical Sciences	740	271,191	403	74,775	296	172,391	32	12,967	10	8,887	*55.21%*
1999	34	10,821	12	2,794	22	7,384					*35.29%*
2000	34	14,416	17	2,921	15	5,760			2	5,372	*53.13%*
2001	42	12,081	15	1,654	26	9,652			1	5	*36.59%*
2002	40	52,649	21	4,273	19	48,870					*52.50%*
2003	48	18,395	24	2,398	23	13,832			1	1,943	*51.06%*
2004	44	11,114	26	4,463	18	6,313					*59.09%*
2005	41	13,361	21	6,566	17	5,764			3	938	*55.26%*
2006	53	13,301	35	3,867	18	9,428					*66.04%*
2007	57	12,594	37	6,137	19	5,948			1	503	*66.07%*
2008	52	14,107	32	5,349	20	8,875					*61.54%*
2009	53	20,685	32	4,866	21	15,810					*60.38%*
2010	37	9,809	19	1,779	17	8,019			1	10	*52.78%*
2011	63	18,434	35	7,050	28	11,215					*55.56%*
2012	60	18,250	32	5,521	17	8,167	12	4,360			*53.33%*
2013	82	31,175	45	15,138	16	7,354	20	8,607	1	117	*55.56%*
Atmospheric & Oceanic Sciences	352	240,951	159	87,084	177	96,415	7	28,891	9	4,627	*46.36%*
1999	26	7,394	13	1,898	13	5,374					*50.00%*
2000	17	7,648	8	4,313	7	2,342			2	360	*53.33%*
2001	18	4,473	9	1,733	9	2,785					*50.00%*
2002	25	12,835	14	9,034	10	3,234			1	103	*58.33%*
2003	27	9,092	12	3,120	15	5,950					*44.44%*
2004	23	6,285	12	2,137	11	4,054					*52.17%*
2005	25	37,041	12	14,421	12	2,699			1	305	*50.00%*
2006	22	5,816	10	2,028	11	2,903			1	841	*47.62%*
2007	35	15,164	11	3,044	22	10,408			2	1,713	*33.33%*
2008	22	28,878	12	23,140	9	2,712			1	160	*57.14%*
2009	21	12,640	11	2,879	10	9,761					*52.38%*
2010	16	8,453	8	6,042	8	2,411					*50.00%*
2011	20	9,881	9	3,669	11	6,093					*45.00%*
2012	33	38,345	10	4,784	22	32,418			1	1,146	*31.25%*
2013	22	37,005	8	4,843	7	3,271	7	28,891			*36.36%*

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		Success Rate %
Ctr for Study of Brain, Mind & Behavior	119	90,643	48	29,130	57	40,641	0		14	16,983	*45.71%*
2001	1	1,815	1	1,029							*100.00%*
2002	17	9,209	6	4,563	11	3,510					*35.29%*
2003	23	14,090	11	4,108	11	7,948			1	1,383	*50.00%*
2004	15	13,836	6	2,787	6	4,551			3	5,633	*50.00%*
2005	14	14,610	4	1,289	7	10,310			3	2,924	*36.36%*
2006	26	18,313	11	6,559	10	5,913			5	5,177	*52.38%*
2007	13	11,293	6	6,856	5	2,872			2	1,866	*54.55%*
2008	10	7,477	3	1,939	7	5,537					*30.00%*
Center for Theoretical Science	5	1,069	3	698	2	369	0		0		*60.00%*
2007	1	198			1	198					*0.00%*
2008	1	50	1	48							*100.00%*
2009	1	50	1	50							*100.00%*
2010	1	600	1	600							*100.00%*
2012	1	171			1	171					*0.00%*
Chemistry	804	442,455	355	151,266	403	243,326	23	9,175	23	14,745	*45.45%*
1999	61	24,987	24	8,303	35	12,574			2	2,095	*40.68%*
2000	48	18,536	19	6,904	29	10,301					*39.58%*
2001	48	24,936	24	11,391	24	11,290					*50.00%*
2002	52	29,789	20	6,923	28	18,505			4	2,490	*41.67%*
2003	45	26,876	24	8,866	20	14,530			1		*54.55%*
2004	54	58,226	26	7,423	28	49,392					*48.15%*
2005	43	26,311	19	10,626	24	14,115					*44.19%*
2006	45	25,052	24	9,567	18	7,549			3	5,993	*57.14%*
2007	71	31,088	24	16,004	42	12,759			5	2,324	*36.36%*
2008	42	19,951	13	5,266	27	12,972			2	334	*32.50%*
2009	52	37,575	26	10,011	22	25,043			4	834	*54.17%*
2010	55	34,459	23	9,024	31	23,704			1	525	*42.59%*
2011	60	27,263	25	11,851	35	14,631					*41.67%*
2012	62	31,772	29	19,224	24	9,143	8	1,317	1	150	*47.54%*
2013	66	25,633	35	9,882	16	6,817	15	7,859			*53.03%*
Ecology & Evolutionary Biology	485	171,636	188	47,785	268	96,604	16	10,050	14	5,162	*39.92%*
1999	23	6,095	8	2,926	13	2,548			2	268	*38.10%*
2000	26	5,345	14	1,318	12	3,539					*53.85%*
2001	26	13,827	19	6,256	7	3,017					*73.08%*
2002	34	7,313	16	2,723	16	2,894			2	1,428	*50.00%*
2003	41	13,854	19	3,827	19	7,404			3	2,576	*50.00%*
2004	32	10,439	8	189	24	10,135					*25.00%*
2005	29	6,957	10	1,951	18	3,732			1	50	*35.71%*
2006	32	11,451	13	3,582	15	6,749			4	614	*46.43%*
2007	24	7,858	9	1,418	14	6,327			1	111	*39.13%*
2008	36	12,762	11	1,520	25	11,271					*30.56%*
2009	33	14,199	15	5,685	18	7,326					*45.45%*
2010	21	6,711	8	4,070	13	2,879					*38.10%*
2011	32	12,522	6	1,431	27	11,053					*18.75%*
2012	46	19,044	20	6,630	23	8,950	2	2,226	1	115	*44.44%*
2013	50	23,261	12	4,259	24	8,782	14	7,824			*24.00%*

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		Success Rate %
Geosciences	531	177,747	247	64,791	246	97,693	25	11,706	13	2,838	*47.68%*
1999	31	9,196	15	6,853	16	3,465					*48.39%*
2000	41	12,307	22	6,118	19	5,884					*53.66%*
2001	33	11,750	13	3,971	18	6,724			2	1,088	*41.94%*
2002	23	5,222	15	3,134	6	2,145			2	55	*71.43%*
2003	22	8,835	10	2,351	12	5,981					*45.45%*
2004	28	11,497	14	3,519	14	7,253					*50.00%*
2005	31	7,729	14	2,970	15	4,692			2	60	*48.28%*
2006	37	9,287	14	2,674	21	6,519			2	84	*40.00%*
2007	42	10,672	20	4,798	21	5,588			1	286	*48.78%*
2008	36	12,173	16	3,841	18	7,977			2	260	*47.06%*
2009	37	11,217	18	3,667	18	6,968			1	537	*50.00%*
2010	50	21,047	22	7,998	28	12,910					*44.00%*
2011	40	16,424	23	8,103	16	7,852			1	469	*58.97%*
2012	44	15,870	19	3,585	13	3,460	12	8,706			*43.18%*
2013	36	14,520	12	1,207	11	10,273	13	3,000			*33.33%*
Lewis-Sigler Institute/Genomic	358	405,188	159	147,704	174	191,355	17	31,772	8	8,010	*45.43%*
2002	3	9,762			3	9,762					*0.00%*
2003	5	6,200	3	3,523	2	2,111					*60.00%*
2004	22	74,753	6	19,812	15	51,616			1	1,704	*28.57%*
2005	37	33,411	18	13,041	15	11,929			4	5,802	*54.55%*
2006	31	20,392	8	4,640	22	14,232			1	183	*26.67%*
2007	32	35,746	11	10,386	21	25,461					*34.38%*
2008	44	39,050	21	18,732	23	19,244					*47.73%*
2009	53	57,051	25	36,004	27	17,052			1	165	*48.08%*
2010	38	35,160	13	7,523	25	23,767					*34.21%*
2011	35	28,829	23	14,938	11	9,294			1	156	*67.65%*
2012	34	45,224	18	12,676	10	6,888	6	20,438			*52.94%*
2013	24	19,611	13	6,429			11	11,333			*54.17%*
Mathematics	297	104,035	214	50,912	67	35,304	2	1,631	14	7,550	*75.62%*
1999	8	1,605	3	418	5	746					*37.50%*
2000	21	7,152	15	3,377	5	1,867			1	93	*75.00%*
2001	12	2,563	10	1,136	2	421					*83.33%*
2002	15	19,020	11	1,715	2	15,110			2	221	*84.62%*
2003	25	7,548	14	4,511	10	1,767			1	108	*58.33%*
2004	21	9,103	15	1,614	6	6,167					*71.43%*
2005	14	7,049	11	4,879	2	638			1	1,494	*84.62%*
2006	24	4,373	18	3,173	6	1,177					*75.00%*
2007	21	3,348	17	2,929	2	258			2	161	*89.47%*
2008	20	6,736	17	5,222	2	271			1	1,244	*89.47%*
2009	19	7,363	12	3,969	6	3,041			1	275	*66.67%*
2010	14	5,788	13	4,469					1	1,319	*100.00%*
2011	17	5,363	13	3,689	4	1,315					*76.47%*
2012	30	6,929	20	3,229	7	1,099			3	2,601	*74.07%*
2013	36	10,094	25	6,582	8	1,428	2	1,631	1	35	*71.43%*

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		*Success Rate %*
Molecular Biology	2065	1,218,208	726	354,451	1127	636,911	131	94,923	81	51,433	*36.59%*
1999	114	70,026	47	35,665	57	24,513			10	912	*45.19%*
2000	100	64,397	51	42,485	47	14,123			2	1,100	*52.04%*
2001	128	69,395	46	16,222	78	46,230			4	4,158	*37.10%*
2002	127	86,318	52	34,119	65	37,502			10	9,656	*44.44%*
2003	136	73,284	42	19,222	92	45,261			2	4,522	*31.34%*
2004	145	83,286	53	26,767	83	41,527			9	2,660	*38.97%*
2005	140	88,599	46	19,316	90	57,846			4	6,080	*33.82%*
2006	204	106,890	51	21,914	141	70,706			12	6,413	*26.56%*
2007	193	100,529	49	20,811	135	75,492			9	4,941	*26.63%*
2008	133	84,412	55	28,889	70	44,525			8	2,088	*44.00%*
2009	154	79,967	61	19,808	88	54,120			5	2,449	*40.94%*
2010	119	57,288	45	14,551	71	36,794			3	1,453	*38.79%*
2011	113	82,791	39	13,995	71	59,023	2	731	1	4,790	*34.82%*
2012	138	95,539	47	18,883	30	23,298	59	49,195	2	212	*34.56%*
2013	121	75,485	42	21,805	9	5,952	70	44,997			*34.71%*
PEI	143	133,193	73	73,870	60	52,290	4	759	6	2,741	*53.28%*
1999	3	5,554	2	2,643	1	1,500					*66.67%*
2000	2	4,157	1	3,002	1	854					*50.00%*
2001	14	12,749	3	5,642	10	6,777			1	374	*23.08%*
2002	11	10,738	6	6,993	5	1,868					*54.55%*
2003	12	6,617	4	651	8	5,955					*33.33%*
2004	10	3,666	7	1,424	3	2,241					*70.00%*
2005	10	4,631	6	437	3	3,694			1	500	*66.67%*
2006	13	23,931	9	17,286	3	6,197			1	449	*75.00%*
2007	7	6,756	4	2,539	2	3,782			1	446	*66.67%*
2008	6	2,011	2	511	3	1,052			1	449	*40.00%*
2009	10	24,710	4	15,807	6	8,873					*40.00%*
2010	13	3,740	9	1,450	4	2,290					*69.23%*
2011	11	15,560	8	14,134	3	1,426					*72.73%*
2012	12	6,088	4	194	7	5,267			1	523	*36.36%*
2013	9	2,286	4	1,159	1	515	4	759			*44.44%*
PICSciE	18	23,037	6	2,960	11	19,797	1	51	0		*33.33%*
2004	1	2,000			1	2,000					*0.00%*
2006	1	11,937			1	11,937					*0.00%*
2008	1	1,860			1	1,860					*0.00%*
2009	2	1,468	1	103	1	1,365					*50.00%*
2010	3	1,570	1	1,470	2	100					*33.33%*
2011	3	1,595	2	512	1	1,079					*66.67%*
2012	4	1,150	2	875	2	50					*50.00%*
2013	3	1,457			2	1,406	1	51			*0.00%*
Physics	644	597,258	385	276,053	210	252,416	21	16,943	26	30,825	*62.30%*
1999	36	38,479	19	6,228	14	11,113			3	20,550	*57.58%*
2000	32	20,723	15	5,176	13	5,417			4	4,841	*53.57%*
2001	33	26,394	16	9,636	10	13,924			7	1,260	*61.54%*
2002	52	55,975	35	39,024	15	15,024			2	98	*70.00%*
2003	33	14,729	21	5,695	11	6,799			1	300	*65.63%*
2004	34	15,566	23	8,339	10	6,646			1	461	*69.70%*
2005	38	41,287	22	19,340	14	17,741			2	1,820	*61.11%*
2006	32	11,891	19	3,999	11	6,707			2	96	*63.33%*
2007	43	23,415	30	13,057	13	10,286					*69.77%*
2008	48	56,848	31	24,430	16	29,958			1	303	*65.96%*
2009	41	38,598	24	14,901	17	22,967					*58.54%*
2010	78	67,116	49	31,010	27	35,604			2	1,041	*64.47%*
2011	52	125,354	27	65,302	25	60,209					*51.92%*
2012	49	40,323	27	20,119	13	9,507	8	8,461	1	55	*56.25%*
2013	43	20,560	27	9,800	1	515	13	8,482			*62.79%*

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		Success Rate %
Princeton Neuroscience Institute	122	118,717	44	27,075	58	76,307	17	8,269	3	6,245	*36.97%*
2005	1	10,722			1	10,722					*0.00%*
2006	3	7,492	1	1,494					2	5,909	*100.00%*
2007	1	2,241	1	2,241							*100.00%*
2008	4	2,678			4	2,678					*0.00%*
2009	17	14,041	8	3,493	9	10,337					*47.06%*
2010	24	22,650	8	2,108	15	20,200			1	336	*34.78%*
2011	15	20,513	5	4,456	10	16,025					*33.33%*
2012	29	25,352	13	10,759	13	10,996	3	3,119			*44.83%*
2013	28	13,029	8	2,523	6	5,350	14	5,150			*28.57%*
Psychology	472	231,757	177	54,780	265	147,388	6	2,932	22	19,262	*39.33%*
1999	37	34,192	11	5,809	24	17,782			2	8,077	*31.43%*
2000	49	24,053	21	12,299	26	10,260			2	367	*44.68%*
2001	26	11,086	14	3,543	9	5,883			1	700	*56.00%*
2002	21	9,628	11	4,059	10	4,208					*52.38%*
2003	34	12,383	14	2,340	17	8,285			3	1,443	*45.16%*
2004	45	21,642	13	2,996	28	16,074			4	2,489	*31.71%*
2005	32	18,825	9	3,244	20	13,585			3	1,777	*31.03%*
2006	43	22,062	14	3,354	27	16,893			2	1,672	*34.15%*
2007	30	16,349	12	3,270	15	11,291			3	1,787	*44.44%*
2008	29	13,303	10	1,349	18	10,265			1	948	*35.71%*
2009	36	13,640	13	1,834	22	11,910			1		*37.14%*
2010	27	9,054	9	1,810	18	7,279					*33.33%*
2011	15	5,266	5	701	10	4,248					*33.33%*
2012	28	11,454	10	4,558	18	7,527					*35.71%*
2013	20	8,821	11	3,615	3	1,898	6	2,932			*55.00%*
Engineering	**5010**	**$3,490,997**	**2264**	**$841,080**	**2516**	**$2,348,085**	**107**	**$56,195**	**128**	**$142,469**	***46.37%***
SEAS	5	1,357	1	250	4	1,106	0		0		*20.00%*
1999	1	93			1	93					*0.00%*
2012	3	750	1	250	2	500					*33.33%*
2013	1	514			1	514					*0.00%*
Andlinger Ctr for Energy/Env	10	8,130	1	166	6	6,770	3	1,194	0		*10.00%*
2011	1				1						*0.00%*
2012	3	3,273			3	3,273					*0.00%*
2013	6	4,857	1	166	2	3,497	3	1,194			*16.67%*
Ctr for Energy & Environ Studies	16	6,330	13	1,930	3	1,309	0		0		*81.25%*
2011	16	6,330	13	1,930	3	1,309					*81.25%*
Ctr Information Tech	9	6,628	3	620	6	6,008	0		0		*33.33%*
2008	1	390	1	390							*100.00%*
2009	2	1,875			2	1,875					*0.00%*
2010	1	1,308			1	1,308					*0.00%*
2011	4	2,255	2	230	2	2,025					*50.00%*
2012	1	800			1	800					*0.00%*

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Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		Success Rate %
Chemical and Biological Eng	625	301,481	273	95,662	298	168,051	43	28,176	12	4,095	*44.54%*
1999	32	6,686	21	3,621	10	3,042			1	25	*67.74%*
2000	35	8,339	15	2,155	20	6,168					*42.86%*
2001	28	9,512	15	3,341	13	5,705					*53.57%*
2002	32	24,897	21	19,377	11	4,051					*65.63%*
2003	24	6,148	13	2,777	9	2,844			2	66	*59.09%*
2004	36	10,522	23	6,262	13	4,224					*63.89%*
2005	36	14,943	20	4,526	14	9,183			2	844	*58.82%*
2006	35	12,509	20	5,635	15	6,529					*57.14%*
2007	29	13,704	11	3,742	17	9,772			1	176	*39.29%*
2008	53	31,840	27	7,936	24	21,208			2	1,865	*52.94%*
2009	56	37,282	22	15,678	34	21,544					*39.29%*
2010	58	37,727	14	2,606	42	34,032			2	564	*25.00%*
2011	52	23,285	14	3,375	36	19,391			2	557	*28.00%*
2012	60	32,700	22	8,705	28	15,696	11	9,213			*36.67%*
2013	59	31,385	15	5,926	12	4,664	32	18,963			*25.42%*
Civil & Environmental Engin	636	241,867	253	50,961	347	177,770	6	4,240	8	2,146	*40.29%*
1999	32	8,809	14	1,756	18	6,551					*43.75%*
2000	30	8,354	13	2,843	17	5,777					*43.33%*
2001	23	5,530	13	1,499	10	3,689					*56.52%*
2002	32	12,079	14	1,798	18	9,823					*43.75%*
2003	34	17,466	11	1,853	23	15,611					*32.35%*
2004	54	32,282	14	3,650	18	28,511					*25.93%*
2005	49	15,872	12	1,993	36	13,435			1	446	*25.00%*
2006	39	13,534	10	4,992	28	8,348			1	165	*26.32%*
2007	35	14,645	17	3,494	18	7,821					*48.57%*
2008	39	13,680	21	3,308	18	10,360					*53.85%*
2009	45	14,949	27	7,261	17	7,167			1	349	*61.36%*
2010	60	18,844	24	4,861	33	13,161			3	448	*42.11%*
2011	53	12,141	22	4,364	30	6,936			1	737	*42.31%*
2012	54	33,424	19	3,961	35	27,929					*35.19%*
2013	57	20,260	22	3,327	28	12,651	6	4,240	1		*39.29%*
Computer Science	479	365,590	237	115,384	230	221,520	7	4,989	5	2,441	*50.00%*
1999	21	26,905	10	8,321	11	15,881					*47.62%*
2000	15	10,341	7	2,669	8	6,904					*46.67%*
2001	19	17,293	10	5,174	9	9,797					*52.63%*
2002	19	8,968	8	2,782	10	4,877			1	35	*44.44%*
2003	38	38,187	18	11,165	18	20,390			2	1,384	*50.00%*
2004	34	31,813	14	3,794	20	27,798					*41.18%*
2005	48	25,303	23	9,558	24	14,128			1	622	*48.94%*
2006	33	19,314	17	8,902	15	8,491			1	400	*53.13%*
2007	27	7,055	16	1,568	11	5,489					*59.26%*
2008	42	26,079	22	13,533	20	10,832					*52.38%*
2009	41	25,233	19	7,719	22	17,139					*46.34%*
2010	44	24,490	21	7,122	23	17,271					*47.73%*
2011	26	17,264	16	10,702	10	6,132					*61.54%*
2012	44	61,907	26	12,815	18	45,502					*59.09%*
2013	28	25,440	10	9,561	11	10,888	7	4,989			*35.71%*

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		Success Rate %
Electrical Engineering	938	554,246	408	152,639	518	371,396	16	7,234	15	11,361	44.20%
1999	40	20,024	17	3,803	40	13,990			2	937	44.74%
2000	70	44,052	35	13,732	31	24,358			4	4,286	53.03%
2001	46	49,127	27	14,617	19	36,685					58.70%
2002	41	29,593	22	7,322	18	14,845			1	4,500	55.00%
2003	75	43,711	34	9,170	40	32,372			1	16	45.95%
2004	70	61,112	25	9,795	45	51,313					35.71%
2005	65	18,903	25	5,332	38	13,258			2	55	39.68%
2006	80	28,878	36	5,383	43	23,001			1	347	45.57%
2007	73	29,757	37	6,744	34	22,026			2	925	52.11%
2008	58	31,601	22	6,304	36	25,326					37.93%
2009	76	60,906	36	31,698	40	29,102					47.37%
2010	71	32,665	27	6,643	43	24,241			1	287	38.57%
2011	68	44,369	22	10,466	45	31,597			1	9	32.84%
2012	52	33,318	24	12,124	27	19,067	1	900			46.15%
2013	53	26,233	19	9,508	19	10,213	15	6,334			35.85%
Mechanical & Aerospace Engin	1022	494,492	476	142,736	498	305,255	20	5,472	32	28,568	48.08%
1999	56	14,462	38	7,432	16	5,380			2	139	70.37%
2000	69	13,344	42	6,991	25	5,704			2	184	62.69%
2001	46	14,013	25	4,387	19	8,696			2	135	56.82%
2002	75	40,496	30	6,107	41	31,977			4	1,965	42.25%
2003	83	24,644	42	8,005	35	14,294			6	1,228	54.55%
2004	64	48,317	29	10,368	31	29,230			4	7,524	48.33%
2005	62	38,584	34	8,236	27	29,384			1	50	55.74%
2006	54	13,565	25	4,159	28	9,141			1	300	47.17%
2007	72	38,528	34	15,840	36	10,488			2	12,200	48.57%
2008	64	33,237	29	8,048	34	23,709			1	1,230	46.03%
2009	72	82,972	26	30,798	46	48,910			1	360	36.62%
2010	72	31,254	17	2,676	53	27,519			2	975	24.29%
2011	80	45,631	40	10,819	41	33,892					50.00%
2012	88	34,876	38	13,021	47	18,925	3	283	2	928	44.19%
2013	65	20,567	27	5,847	19	8,006	17	5,189	2	1,350	42.86%
Oper Res and Financial Eng	214	74,104	150	38,150	52	29,656	5	2,225	7	1,162	72.46%
1999	11	2,022	9	1,844	2	119					81.82%
2000	8	1,044	8	1,002							100.00%
2001	13	2,621	11	1,230	2	900					84.62%
2002	14	3,462	9	1,798	5	1,648					64.29%
2003	16	3,644	9	1,342	6	1,955			1	14	60.00%
2004	13	2,878	11	1,486	2	1,322					84.62%
2005	21	5,009	12	3,020	6	1,513			3	317	66.67%
2006	18	4,371	13	1,450	5	2,839					72.22%
2007	18	8,929	13	7,477	5	1,452					72.22%
2008	14	3,135	11	1,537	3	975					78.57%
2009	14	13,241	6	2,094	6	10,703			2	160	50.00%
2010	13	3,430	12	2,207	1	1,202					92.31%
2011	12	4,754	8	2,879	3	1,224			1	671	72.73%
2012	16	6,619	11	4,694	4	913	1	1,000			68.75%
2013	13	8,945	7	4,089	2	2,893	4	1,225			53.85%
PRISM	686	677,691	288	141,991	359	463,426	7	2,664	33	57,324	44.10%
2004	49	35,050	28	8,253	16	24,448			5	2,080	63.64%
2005	87	105,899	41	17,174	36	61,663			10	26,228	53.25%
2006	72	34,528	24	10,699	46	23,091			2	222	34.29%
2007	60	21,465	24	4,193	35	17,081			1	190	40.68%
2008	61	97,426	21	11,208	38	62,288			2	22,926	35.59%
2009	70	109,323	29	37,187	41	69,948					41.43%
2010	77	51,909	40	15,105	34	34,840			3	735	54.05%
2011	94	78,376	31	17,681	57	55,499			6	3,738	35.23%
2012	79	43,348	36	18,019	38	21,217	2	200	4	1,204	48.00%
2013	37	100,368	14	2,472	18	93,350	5	2,464			37.84%

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		*Success Rate %*
PMI (merged into PRISM)	202	213,198	85	44,966	111	132,133	0		8	18,196	*43.81%*
1999	30	23,641	15	5,380	15	17,126					*50.00%*
2000	42	38,610	18	10,178	23	18,790			1	60	*43.90%*
2001	59	65,214	17	3,321	42	60,477					*28.81%*
2002	31	62,639	15	19,220	15	21,040			3	16,856	*53.57%*
2003	33	20,367	17	6,430	12	12,412			4	1,279	*58.62%*
2004	7	2,727	3	436	4	2,288					*42.86%*
POEM (merged into PRISM)	168	545,884	76	55,625	84	463,684	0		8	17,175	*47.50%*
1999	47	34,080	19	8,315	26	23,560			2	130	*42.22%*
2000	16	22,208	13	15,246	3	2,046					*81.25%*
2001	18	27,665	16	16,886	2	9,070					*88.89%*
2002	20	17,983	11	11,316	8	6,197			1		*57.89%*
2003	39	79,287	14	3,075	21	75,168			4	1,433	*40.00%*
2004	28	364,660	3	788	24	347,643			1	15,611	*11.11%*
Social Sciences	**1249**	**$453,227**	**748**	**$214,401**	**458**	**$188,100**	**12**	**$7,244**	**29**	**$16,028**	***61.31%***
Anthropology	27	3,982	6	346	20	3,418	0		1	12	*23.08%*
1999	4	850	2	214	2	438					*0.00%*
2000	1	12							1	12	*0.00%*
2001	3	38	1	7	2	24					*33.33%*
2002	1	718			1	718					*0.00%*
2003	1	718			1	718					*0.00%*
2004	2	37			2	37					*0.00%*
2005	1	42			1	42					*0.00%*
2007	4	95	2	67	2	28					*50.00%*
2008	1	449			1	449					*0.00%*
2009	2	223	1	57	1	165					*50.00%*
2010	2	703			2	703					*0.00%*
2011	1	20			1	20					*0.00%*
2012	1	5			1	5					*0.00%*
2013	3	72			3	72					*0.00%*
Cntr-African American Studies	2	340	1	65	1	275	0		0		*50.00%*
2000	1	65	1	65							*100.00%*
2010	1	275			1	275					*0.00%*
Center for Study of Human Values	3	966	3	439	0		0		0		*100.00%*
1999	1	927	1	400							*100.00%*
2005	1	24	1	24							*100.00%*
2011	1	15	1	15							*100.00%*
Ctr of Dom/Comp Policy Studies	22	2,517	9	1,317	12	1,071	0		1	158	*42.86%*
1999	10	905	4	478	6	426					*40.00%*
2000	12	1,613	5	839	6	644			1	158	*45.45%*
Ctr of International Studies	21	2,007	12	1,292	9	606	0		0		*57.14%*
1999	4	210	1	42	3	149					*25.00%*
2000	7	657	5	450	2	207					*71.43%*
2001	4	538	3	338	1	110					*75.00%*
2002	4	240	1	100	3	140					*25.00%*
2003	2	362	2	362							*100.00%*

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Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		Success Rate %
Economics	140	24,501	85	11,030	53	16,125	1	3,200	1	351	61.15%
1999	14	1,515	11	1,084	3	540					78.57%
2000	9	1,474	7	893	2	506					77.78%
2001	8	1,196	6	878	2	325					75.00%
2002	9	1,193	7	798	2	380					77.78%
2003	9	1,559	3	430	6	7,404					33.33%
2004	17	2,482	8	1,021	9	1,387					47.06%
2005	12	1,614	6	544	6	1,059					50.00%
2006	6	1,134	5	783					1	351	100.00%
2007	8	1,202	6	859	2	343					75.00%
2008	7	741	6	603	1	163					85.71%
2009	9	1,434	5	818	4	616					55.56%
2010	6	1,251	3	433	3	818					50.00%
2011	7	1,793	3	676	4	1,081					42.86%
2012	11	1,662	4	467	7	1,196					36.36%
2013	8	4,251	5	743	2	308	1	3,200			62.50%
Education Research Section	2	382	2	382	0		0		0		100.00%
2002	1	121	1	121							100.00%
2003	1	262	1	262							100.00%
History	63	9,366	40	5,992	22	2,915	0		1	506	64.52%
1999	1	39	1	39							100.00%
2000	3	138	3	135							100.00%
2001	4	232	2	170	2	46					50.00%
2002	1	11	1	8							100.00%
2003	6	184	5	170	1	14					83.33%
2004	6	231	4	188	2	43					66.67%
2005	3	1,633	3	1,633							100.00%
2006	3	110	3	110							100.00%
2007	6	2,408	5	2,378	1	31					83.33%
2008	13	1,909	8	211	4	1,192			1	506	66.67%
2009	3	431	1	283	2	219					33.33%
2010	3	26	1	16	2	10					33.33%
2011	8	1,279	1	55	7	1,224					12.50%
2012	3	735	2	595	1	137					66.67%
2013	0										0.00%
History of Science	7	666	3	283	3	369	0		1	14	50.00%
1999	1	262	1	262							100.00%
2001	1	14							1	14	0.00%
2003	1	166			1	166					0.00%
2005	2	21	2	21							100.00%
2006	1	190			1	190					0.00%
2011	1	14			1	14					0.00%
Industrial Relations Section	2	335	1	46	1	289	0		0		50.00%
1999	1	46	1	46							100.00%
2001	1	289			1	289					0.00%

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		Success Rate %
Office of Population Research	306	206,928	185	100,464	103	70,897	6	2,603	9	12,584	*62.29%*
1999	19	7,637	10	2,302	5	2,939			1	97	*55.56%*
2000	24	8,931	14	3,432	10	1,847					*58.33%*
2001	18	10,169	11	6,548	6	1,414			1	1,411	*64.71%*
2002	22	9,722	13	6,123	7	1,641			2	1,850	*65.00%*
2003	25	11,630	19	7,846	5	2,854			1	384	*79.17%*
2004	25	23,174	19	12,725	5	3,644			1	4,849	*79.17%*
2005	24	26,873	17	3,336	7	22,555					*70.83%*
2006	15	30,130	10	20,296	5	4,010					*66.67%*
2007	11	11,360	5	3,938	6	7,421					*45.45%*
2008	15	13,319	7	4,634	7	7,533			1	158	*50.00%*
2009	30	19,055	14	12,802	15	4,557			1	514	*48.28%*
2010	15	7,806	8	2,513	7	4,451					*53.33%*
2011	16	14,769	12	10,376	4	3,231					*75.00%*
2012	20	7,460	10	1,942	9	2,074			1	3,320	*52.63%*
2013	27	4,895	16	1,652	5	727	6	2,603			*59.26%*
Papers of Thomas Jefferson	15	4,106	15	2,308	0		0		0		*100.00%*
1999	2	804	2	309							*100.00%*
2001	1	527	1	400							*100.00%*
2003	3	458	3	458							*100.00%*
2004	3	528	3	345							*100.00%*
2007	2	237	2	237							*100.00%*
2008	2	1,342	2	348							*100.00%*
2009	1	75	1	75							*100.00%*
2010	1	135	1	135							*100.00%*
Politics	105	12,009	57	4,975	45	6,180	2	340	1	5	*54.81%*
1999	3	131	3	128							*100.00%*
2000	2	394	2	394							*100.00%*
2001	2	44	1	2	1	42					*50.00%*
2002	5	298	3	198	1	25			1	5	*75.00%*
2003	3	747	1	38	2	709					*33.33%*
2004	2	112	1	100	1	12					*50.00%*
2005	9	1,550	4	501	5	765					*44.44%*
2006	6	400	2	154	4	247					*33.33%*
2007	3	535	1	55	2	480					*33.33%*
2008	2	183	1	53	1	130					*50.00%*
2009	7	501	6	391	1	12					*85.71%*
2010	12	1,231	5	672	7	560					*41.67%*
2011	19	2,216	12	1,434	7	747					*63.16%*
2012	19	1,947	10	511	9	1,426					*52.63%*
2013	11	1,720	5	345	4	1,025	2	340			*45.45%*
Prin Inst Intl & Reg Stu-PIIRS	11	1,309	6	601	5	692	0		0		*54.55%*
2004	1	10	1	10							*100.00%*
2005	1	512			1	512					*0.00%*
2007	1	76	1	76							*100.00%*
2009	5	541	3	445	2	80					*60.00%*
2010	2	100			2	100					*0.00%*
2013	1	70	1	70							*100.00%*

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		*Success Rate %*
Sociology	118	18,839	75	8,926	43	9,177	0		1	4	*64.10%*
1999	8	5,713	4	371	4	5,142					*50.00%*
2000	11	1,894	7	998	4	884					*63.64%*
2001	7	874	5	549	2	118					*71.43%*
2002	11	1,532	8	1,316	3	197					*72.73%*
2003	8	760	3	206	5	555					*37.50%*
2004	8	322	4	84	4	108					*50.00%*
2005	9	1,461	6	1,121	3	339					*66.67%*
2006	6	356	6	337							*100.00%*
2007	8	1,135	6	1,118	2	17					*75.00%*
2008	6	98	3	76	2	14			1	4	*60.00%*
2009	2	1,243	1	750	1	350					*50.00%*
2010	7	1,091	6	1,067	1	24					*85.71%*
2011	11	1,273	6	193	6	1,080					*54.55%*
2012	10	815	7	708	3	107					*70.00%*
2013	6	272	3	29	3	243					*50.00%*
The Survey Research Center (WWS)	9	4,772	7	4,541	1	104	0		1	121	*87.50%*
2000	1	208	1	178							*100.00%*
2002	1	121							1	121	*0.00%*
2003	3	3,411	3	3,435							*100.00%*
2004	2	204	1	99	1	104					*50.00%*
2010	1	329	1	329							*100.00%*
2013	1	500	1	500							*100.00%*
WWS/Graduate/ Central	396	160,201	241	71,394	140	75,984	3	1,102	12	2,272	*62.76%*
1999	6	244	2	81	3	139			1	24	*40.00%*
2000	9	5,529	7	3,468	2	518					*77.78%*
2001	22	5,778	15	3,714	7	943					*68.18%*
2002	32	6,171	22	3,896	10	1,161					*68.75%*
2003	37	12,111	18	4,989	18	3,166			1	45	*50.00%*
2004	32	13,013	18	3,903	12	9,045			2	150	*60.00%*
2005	39	8,960	21	3,089	17	5,392			1	69	*55.26%*
2006	29	9,151	21	6,575	7	1,793			1	750	*75.00%*
2007	29	4,198	21	2,213	6	1,627			2	359	*77.78%*
2008	17	2,272	13	1,924	3	263			1	8	*81.25%*
2009	24	28,834	15	9,766	9	18,615					*62.50%*
2010	27	15,855	16	9,930	9	5,505			2	404	*64.00%*
2011	36	13,741	21	4,191	14	8,308	1	799			*58.33%*
2012	31	18,760	14	3,086	17	15,237					*45.16%*
2013	26	15,585	17	10,569	6	4,272	2	302	1	465	*68.00%*
Humanities	**203**	**$49,143**	**153**	**$29,930**	**44**	**$13,925**	**1**	**$8**	**6**	**$491**	***77.66%***
Architecture	18	1,964	14	528	4	1,456	0		0		*77.78%*
2000	2	240	2	275							*100.00%*
2001	2	92	2	92							*100.00%*
2002	1	1,252	1			1,252					*100.00%*
2004	2	20	2	20							*100.00%*
2005	2	18	2	8							*100.00%*
2006	2	25	1	10	1	10					*50.00%*
2007	1	100	1	100							*100.00%*
2009	1	10	1	10							*100.00%*
2010	4	204	1	10	3	194					*25.00%*
2011	1	3	1	3							*100.00%*
Art and Archaeology	10	2,689	7	1,538	1	255	0		2	270	*87.50%*
2002	2	1,021	2	1,021							*100.00%*
2003	3	361	2	96					1	265	*100.00%*
2005	1	5							1	5	*0.00%*
2006	1	998	1	371							*100.00%*
2009	1	30	1	30							*100.00%*
2011	2	275	1	20	1	255					*50.00%*

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		Success Rate %
Center for Study of Religion	10	6,168	9	5,667	1	261	0		0		*90.00%*
2001	1	753	1	796							*100.00%*
2002	1	712	1	712							*100.00%*
2004	2	2,055	2	1,778							*100.00%*
2005	2	825	2	820							*100.00%*
2006	1	6	1	6							*100.00%*
2007	1	261			1	261					*0.00%*
2008	1	1,500	1	1,500							*100.00%*
2010	1	55	1	55							*100.00%*
Classics	2	65	2	65	0		0		0		*100.00%*
2001	1	30	1	30							*100.00%*
2010	1	35	1	35							*100.00%*
Comparative Literature	7	1,983	7	1,902	0		0		0		*100.00%*
2000	1	65	1	65							*100.00%*
2002	1	172	1	172							*100.00%*
2003	1	28	1	28							*100.00%*
2006	1	50	1	50							*100.00%*
2008	1	1,580	1	1,500							*100.00%*
2009	1	50	1	50							*100.00%*
2013	1	37	1	37							*100.00%*
Concerts Committee	1	6	1	6							*100.00%*
2013	1	6	1	6							*100.00%*
The Council of the Humanities	2	113	0		1	109	0		1	4	*0.00%*
2000	2	113			1	109			1	4	*0.00%*
East Asian Studies	28	6,061	23	3,840	5	1,477	0		0		*82.14%*
1999	4	828	2	185	2	643					*50.00%*
2000	2	395	2	350							*100.00%*
2001	6	1,301	5	570	1	210					*83.33%*
2002	2	370	2	161							*100.00%*
2003	1	554			1	554					*0.00%*
2005	1	85	1	85							*100.00%*
2006	4	588	4	594							*100.00%*
2007	2	100	2	100							*100.00%*
2008	2	55	2	80							*100.00%*
2009	1	210	1	210							*100.00%*
2010	1	5	1	5							*100.00%*
2011	2	1,570	1	1,500	1	70					*50.00%*
East Asian Studies Program	10	2,558	8	475	2	1,938	0		0		*80.00%*
2000	1	1,723			1	1,723					*0.00%*
2003	1	47	1	47							*100.00%*
2004	3	455	2	97	1	215					*66.67%*
2005	1	93	1	93							*100.00%*
2006	2	115	2	115							*100.00%*
2008	1	100	1	98							*100.00%*
2013	1	25	1	25							*100.00%*
English	18	1,287	12	724	6	523	0		0		*66.67%*
2000	2	242			2	242					*0.00%*
2002	2	137	1	15	1	122					*50.00%*
2003	4	134	3	115	1	5					*75.00%*
2004	1	120	1	120							*100.00%*
2005	1	177	1	152							*100.00%*
2009	2	85	2	85							*100.00%*
2011	4	266	2	113	2	153					*50.00%*
2013	2	124	2	124							*100.00%*

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		*Success Rate %*
French and Italian	5	436	2	111	3	310	0		1	5	*50.00%*
2002	1	37	1	37							*100.00%*
2003	1	81			1	76			1	5	*0.00%*
2011	2	234			2	234					*0.00%*
2012	1	84	1	74							*100.00%*
German	6	193	4	192	2	4	0		0		*66.67%*
2000	1	4			1	4					*0.00%*
2003	1	47	1	55							*100.00%*
2005	1	75	1	75							*100.00%*
2006	1	65	1	60							*100.00%*
2007	1				1						*0.00%*
2012	1	2	1	2							*100.00%*
Latin American Studies Program	3	795	1	20	2	775	0		0		*33.33%*
2001	1	541			1	541					*0.00%*
2003	1	20	1	20							*100.00%*
2010	1	234			1	234					*0.00%*
Program in Linguistics	1	233	0		1	233	0		0		*0.00%*
2000	1	233			1	233					*0.00%*
Music	20	1,198	16	841	3	340	1	8	0		*80.00%*
1999	1	19	1	19							*100.00%*
2000	1	125	1	125							*100.00%*
2001	2	161	2	159							*100.00%*
2003	1	134	1	142							*100.00%*
2004	2	330			2	330					*0.00%*
2005	1	8	1	8							*100.00%*
2006	1	75	1	75							*100.00%*
2007	3	56	3	56							*100.00%*
2008	5	276	4	251	1	10					*80.00%*
2011	1	5	1	5							*100.00%*
2012	1	1	1	1							*100.00%*
2013	1	8					1	8			*0.00%*
Near Eastern Studies	15	3,178	11	3,060	4	908	0		0		*73.33%*
1999	3	506	1	31	2	474					*33.33%*
2000	1	108	1	108							*100.00%*
2001	1	118	1	61							*100.00%*
2003	3	1,939	2	1,558	1	351					*66.67%*
2005	1	50	1	50							*100.00%*
2006	1	104	1	50							*100.00%*
2007	1		1	935							*100.00%*
2009	2	185	1	100	1	83					*50.00%*
2010	2	167	2	167							*100.00%*
Near Eastern Studies Program	6	5,557	6	3,625	0		0		0		*100.00%*
2000	1	1,782	1	664							*100.00%*
2003	1	1,677	1	928							*100.00%*
2006	1	654	1	752							*100.00%*
2008	1	20	1	60							*100.00%*
2010	1	1,280	1	1,077							*100.00%*
2012	1	144	1	144							*100.00%*
Peter B. Lewis Center - Arts	1	300	1	300							*100.00%*
2013	1	300	1	300							*100.00%*

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		*Success Rate %*
Philosophy	17	6,317	13	1,016	4	3,734	0		0		*76.47%*
2000	1	10	1	10							*100.00%*
2002	2	1,770	2	285							*100.00%*
2004	1	2,766			1	2,766					*0.00%*
2005	1	424			1	424					*0.00%*
2006	1	183	1	149							*100.00%*
2007	2	158	1		1	158					*50.00%*
2008	1	15	1	15							*100.00%*
2009	3	632	2	235	1	386					*66.67%*
2010	3	257	3	261							*100.00%*
2011	1	20	1	20							*100.00%*
2013	1	83	1	40							*100.00%*
Religion	21	7,883	15	5,870	4	1,593	0		2	212	*78.95%*
1999	1	1,200	1	1,199							*100.00%*
2000	4	2,084	4	2,084							*100.00%*
2001	3	565	2	465	1	100					*66.67%*
2002	1	31			1	31					*0.00%*
2003	1	1,063			1	1,063					*0.00%*
2004	2	273	2	273							*100.00%*
2005	3	771	1	151	1	400			1	112	*50.00%*
2006	2	182	1	82					1	100	*100.00%*
2007	1	1,500	1	1,500							*100.00%*
2008	1	33	1	33							*100.00%*
2009	1	40	1	33							*100.00%*
2010	1	142	1	50							*100.00%*
Theater and Dance	2	159	1	150	1	9					*50.00%*
2005	1	150	1	150							*100.00%*
2007	1	9			1	9					*0.00%*
Non-Dept'l/Other	**96**	**$14,868**	**61**	**$6,284**	**29**	**$9,456**	**3**	**$284**	**4**	**$457**	***66.30%***
Art Museum	27	3,559	13	1,177	10	1,699	3	284	1	30	*50.00%*
1999	1	138			1	138					*0.00%*
2001	1	5	1	2							*100.00%*
2002	3	528	1	115	2	413					*33.33%*
2003	1	150	1	150							*100.00%*
2004	1	40	1	40							*100.00%*
2005	4	630			3	600			1	30	*0.00%*
2006	2	353	2	203							*100.00%*
2008	2	212	2	102							*100.00%*
2009	1	100	1	5							*100.00%*
2011	3	761	1	500	1	150	1	100			*33.33%*
2012	3	91	2	31			1	60			*66.67%*
2013	5	553	1	30	3	399	1	124			*20.00%*
Dean of Religious Life	2	758	2	758	0		0		0		*100.00%*
2002	1	750	1	750							*100.00%*
2013	1	8	1	8							*100.00%*
Dean of the Faculty	1	100	1	100	0		0		0		*100.00%*
2013	1	100	1	100							*100.00%*
Executive Vice President	1	50	1	50	0		0		0		*100.00%*
1999	1	50	1	50							*100.00%*
Graduate School	8	555	7	365	1	28	0		0		*87.50%*
2003	5	365	4	175	1	28					*80.00%*
2011	1	35	1	35							*100.00%*
2012	2	155	2	155							*100.00%*
Health Services	5	806	3	36	2	770	0		0		*60.00%*
2007	1	20	1	20							*100.00%*
2009	2	16	2	16							*100.00%*
2012	2	770			2	770					*0.00%*

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Success Rates by Number of Submissions*
($ in Thousands)

Divisions Dept/Programs	Total Submitted		Funded		Declined		Pending		Withdrawn		*Success Rate %*
Library	29	2,502	19	1,495	9	772	0		1	125	*67.86%*
1999	5	418	3	167	1	125			1	125	*75.00%*
2000	2	110	2	110							*100.00%*
2001	3	258	1	95	2	163					*33.33%*
2002	1	199			1	199					*0.00%*
2003	1	3	1	3							*100.00%*
2004	1	221			1	221					*0.00%*
2005	2	179	2	102							*100.00%*
2007	1	44	1	44							*100.00%*
2008	2	77	2	71							*100.00%*
2009	3	89	1	30	2	59					*33.33%*
2010	2	332	2	332							*100.00%*
2012	1	253	1	227							*100.00%*
2013	2	309	2	309							*100.00%*
Pace Center	2	7	1	5	1	2	0		0		*50.00%*
2009	1	2			1	2					*0.00%*
2013	1	5	1	5							*100.00%*
Pew Science Program	1	53	1	53	0		0		0		*100.00%*
1999	1	53	1	53							*100.00%*
Teacher Preparation	19	6,253	12	2,094	5	3,849	0		2	302	*70.59%*
1999	1	50			1	50					*0.00%*
2000	1	252							1	252	*0.00%*
2001	4	1,286	2	278	1	957			1	50	*66.67%*
2002	1	247	1	247							*100.00%*
2003	2	2,612	1	275	1	2,337					*50.00%*
2004	4	789	2	283	2	506					*50.00%*
2005	2	237	2	237							*100.00%*
2006	1	260	1	260							*100.00%*
2008	1	300	1	294							*100.00%*
2009	1	200	1	200							*100.00%*
2012	1	20	1	20							*100.00%*
VP for Campus Life	1	225	1	150	1	2,337	0		0		*100.00%*
2002	1	225	1	150	1	2,337					*100.00%*
Grand Total	**13881**	**$8,357,151**	**6499**	**$2,572,704**	**6543**	**$4,798,611**	**428**	**$295,015**	**414**	**$339,330**	***48.26%***

*Excludes PPPL and Grad Sch Fellowships.
Does not include Continuations

Appendix A.2

Yearly New Award Dollars, by Department, 1999-2013¶

¶ Data current as of 4/30/14

Award Dollars moved to Home Departments*
($ in Thousands)

	Fiscal Year														
Divison / Home Unit	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Natural Sciences	**69,851**	**75,253**	**102,229**	**59,511**	**91,261**	**82,410**	**82,813**	**84,933**	**76,062**	**78,338**	**135,469**	**129,187**	**85,048**	**144,350**	**91,985**
Astrophysical Sciences	1,147	6,469	5,052	1,867	2,068	8,531	4,563	7,430	2,672	8,396	4,980	4,588	5,115	7,214	9,971
Atmospheric & Oceanic Sciences	1,227	1,762	1,290	510	550	1,637	1,827	1,393	655	2,336	3,577	820	1,188	2,003	700
Chemistry	16,316	8,558	14,609	9,173	13,345	9,237	10,766	5,990	18,553	7,583	10,657	14,786	12,211	12,457	14,904
Ecology & Evolutionary Biology	2,938	3,593	9,551	9,649	4,767	3,442	2,425	15,993	4,017	1,461	2,660	19,747	2,837	4,616	3,537
Geosciences	9,503	8,625	8,491	4,451	20,942	5,344	2,968	4,423	2,083	7,929	23,789	3,710	11,664	9,380	3,524
Lewis-Sigler Institute/Genomic				2,857	125		6,086	210	3,497	4,440	4,767	1,002	2,396	3,114	3,167
Mathematics	2,818	3,856	2,956	2,237	3,103	4,458	3,262	4,846	4,070	3,643	5,544	7,434	5,113	4,500	7,616
Molecular Biology	18,570	31,674	43,336	10,466	26,446	23,386	36,414	25,127	21,855	20,782	41,062	46,389	9,276	16,754	21,339
PEI		215	492	170	746	217	702	512		511	223	35	792	400	100
Physics	13,449	5,396	7,262	11,533	11,897	18,724	12,764	5,206	7,146	14,459	33,347	27,183	30,380	78,642	13,095
Princtn Neuroscience Institute			624			103		371	161		75	8	307	49	237
Psychology	3,883	5,105	8,566	6,598	7,270	7,331	1,036	13,432	11,352	6,798	4,788	3,483	3,768	5,222	13,795
Engineering	**40,927**	**38,352**	**63,468**	**28,269**	**74,186**	**45,320**	**44,174**	**73,723**	**39,943**	**47,598**	**53,576**	**105,168**	**52,698**	**51,405**	**56,071**
Chemical and Biological Eng	7,107	4,378	7,048	2,727	26,437	3,271	5,002	5,619	5,062	6,237	9,707	7,446	4,113	7,799	9,273
Civil & Environmental Engin	1,883	2,305	4,055	1,934	4,568	3,176	3,359	7,980	2,723	8,207	3,191	8,558	4,790	5,317	4,575
Computer Science	9,869	8,013	4,234	4,929	4,281	15,017	7,234	11,403	9,081	3,756	12,251	12,305	17,550	6,885	15,339
Electrical Engineering	14,482	11,665	28,635	11,814	20,142	11,663	15,922	37,953	12,949	8,502	14,186	41,714	16,835	10,763	14,830
Mechanical & Aerospace Engin	6,019	11,605	18,654	5,534	16,261	10,205	10,846	8,475	8,487	16,623	9,949	33,132	8,009	16,838	7,887
Oper Res and Financial Eng	1,566	386	840	1,306	1,352	1,988	1,811	1,996	1,641	4,273	2,479	2,014	1,343	3,799	4,165
PRISM				25	1,145			297			1,813		58	3	
Social Sciences	**19,368**	**7,885**	**13,645**	**21,577**	**10,599**	**18,165**	**19,410**	**11,649**	**24,553**	**6,965**	**18,967**	**24,887**	**10,757**	**9,089**	**22,323**
Anthropology		175	25						55		200	57			
Economics	534	596	732	876	556	498	1,182	575	738	762	718	799	2,504	867	1,083
History	755	721	280	2,368	596	328	2,611	264	2,220	716	722	471	174	561	338
History of Science				4				10							
Politics	42	341	2	229	139	100	487	413	59	2	528	581	791	1,509	364
Sociology	3,412	1,433	4,536	3,395	307	985	2,528	1,559	2,074	3,004	903	1,360	772	1,734	605
WWS/Graduate/Central	14,624	4,621	8,069	14,706	9,000	16,255	12,602	8,828	19,407	2,481	15,896	21,618	6,517	4,419	19,932
Humanities	**918**	**1,357**	**2,447**	**2,733**	**849**	**2,832**	**795**	**199**	**3,423**	**1,715**	**2,136**	**384**	**1,131**	**1,574**	**165**
Architecture		37	212	42		20	5		110	10			11		
Art and Archaeology		571		410	34	58			371	30			18		
Comparative Literature			65		207			50			1,550				
East Asian Studies	224	202	335	51	273	47	151		702	100	80			1,500	
English	248			15		228		149			40	28		63	50
French and Italian			37												74
German						54	75		60					2	
Music	19	109	24	125		139	8		76	131			5	1	
Near Eastern Studies	427	354	716		58	2,287			1,582	60	100	42	820		
Peter B. Lewis Center - Arts							106					32			
Philosophy			26	1,601	277				430			233	278		40
Religion		83	1,031	489			450		92	1,384	365	50		8	

*Does not include PPPL or Graduate School Fellowships

Appendix A.3

Yearly New Award Dollars per Faculty Member, by Department, 1999-2013¶

¶ Data current as of 4/30/14

Award Dollars per Faculty (Award $/# of Faculty)*
($ in Thousands)

	Fiscal Year														
Divison / Home Unit	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Natural Sciences (average)	**359.3**	**390.5**	**520.8**	**298.1**	**469.8**	**393.1**	**337.8**	**451.8**	**353.6**	**357.5**	**606.8**	**681.3**	**398.2**	**612.2**	**419.1**
Astrophysical Sciences	88.2	497.6	388.6	133.4	137.9	568.7	285.2	437.1	167.0	524.7	292.9	269.9	300.9	400.8	524.8
Chemistry	679.8	342.3	561.9	327.6	476.6	355.3	448.6	239.6	843.3	361.1	560.9	739.3	530.9	519.0	596.2
Ecology & Evolutionary Biology	267.1	299.4	682.2	689.2	340.5	245.8	173.2	1,142.4	286.9	132.8	221.6	1,795.2	283.7	419.7	272.0
Geosciences	559.0	479.2	471.7	247.3	1,231.9	314.3	185.5	245.7	130.2	495.6	1,321.6	195.3	686.1	521.1	185.5
Mathematics	78.3	116.9	77.8	58.9	88.7	120.5	79.6	118.2	104.4	101.2	154.0	185.8	127.8	118.4	211.6
Molecular Biology	663.2	1,021.7	1,397.9	360.9	881.5	754.4	1,103.5	761.4	662.3	611.2	1,283.2	1,405.7	272.8	540.4	688.4
Physics	353.9	154.2	213.6	303.5	321.5	492.7	386.8	153.1	198.5	390.8	855.1	734.7	843.9	2,184.5	363.8
Psychology	184.9	212.7	372.4	263.9	279.6	293.2	39.8	516.6	436.6	242.8	165.1	124.4	139.6	193.4	510.9
Atmospheric & Oceanic Sciences	1,227.5	1,761.8	1,290.2	509.7	550.2	1,636.7	1,827.3	1,392.7	655.3	2,336.4	3,577.2	820.3	1,187.8	2,002.9	699.6
Lewis-Sigler Institute/Genomic				2,857.0	125.0		6,085.9	210.4	3,497.1	4,439.8	4,767.3	1,002.3	2,396.4	3,114.0	3,167.3
Princtn Neuroscience Institute			624.2			102.7		370.6	161.4		75.2	8.2	307.3	49.3	237.2
PEI		215.5	491.9	170.0	746.3	217.4	702.0	512.4		510.5	222.8	35.0	792.1	400.0	100.0
Engineering (average)	**345.6**	**297.4**	**472.2**	**214.9**	**602.7**	**328.1**	**324.2**	**546.9**	**303.9**	**399.7**	**396.5**	**777.3**	**380.4**	**394.0**	**415.3**
Chemical and Biological Eng	473.8	273.6	391.6	151.5	1,555.1	192.4	294.2	374.6	297.8	389.8	606.7	465.4	228.5	433.3	579.5
Civil & Environmental Engin	144.9	192.1	338.0	161.2	351.4	244.3	258.3	665.0	209.4	547.1	199.4	570.5	319.3	332.3	286.0
Computer Science	493.5	333.9	162.9	189.6	152.9	577.6	267.9	422.3	324.3	129.5	437.6	439.5	626.8	229.5	511.3
Electrical Engineering	536.4	432.0	1,101.4	437.5	694.5	376.2	513.6	1,308.7	479.6	303.6	525.4	1,604.4	647.5	414.0	494.3
Mechanical & Aerospace Engin	250.8	504.6	746.2	230.6	739.2	425.2	471.6	368.5	385.8	722.8	432.6	1,440.5	364.0	701.6	342.9
Oper Res and Financial Eng	174.0	48.2	93.4	118.8	122.9	152.9	139.3	142.6	126.2	305.2	177.1	143.9	96.0	253.3	277.7
PRISM				25.0	1,145.2			297.1			1,812.5		57.8	3.0	
Social Sciences (average)	**78.0**	**38.5**	**70.2**	**82.1**	**31.8**	**50.8**	**73.0**	**42.8**	**76.4**	**37.2**	**55.7**	**69.8**	**37.1**	**36.8**	**59.5**
Anthropology		25.0	2.5						5.5		18.2	5.7			
Economics	19.8	23.8	27.1	31.3	20.6	19.9	45.5	20.5	24.6	25.4	25.7	29.6	86.3	29.9	36.1
History	18.4	17.6	6.7	56.4	14.9	8.6	67.0	7.1	60.0	19.4	17.6	9.8	3.5	10.4	6.4
History of Science				0.1				0.3							
Politics	1.9	17.0	0.1	12.0	6.0	3.2	16.2	13.3	2.3	0.1	18.8	20.0	27.3	52.0	12.1
Sociology	213.3	95.5	302.4	212.2	20.5	61.6	168.6	111.3	129.6	176.7	53.1	80.0	45.4	96.3	40.4
WWS/Graduate/Central	292.5	90.6	152.3	262.6	160.7	262.2	213.6	147.1	313.0	38.8	256.4	343.1	97.3	69.0	321.5
Humanities (average)	**5.1**	**7.8**	**17.8**	**13.2**	**5.6**	**20.2**	**5.2**	**0.9**	**22.2**	**9.0**	**15.0**	**1.8**	**7.0**	**9.2**	**0.8**
Architecture		4.1	23.6	4.7		2.9	0.5		10.0	1.0			1.0		
Art and Archaeology		33.6		21.6	1.8	3.0			21.8	1.5			1.1		
Comparative Literature			6.5		23.1			5.6			140.9				
East Asian Studies	18.7	15.6	27.9	3.9	22.7	3.6	11.6		50.2	7.1	5.3			107.1	
English	8.0			0.5		7.1		4.7			1.3	0.9		2.2	1.7
French and Italian			2.6												5.7
German						6.0	8.3		6.0					0.3	
Music	1.5	8.4	2.2	10.4		11.6	0.8		6.9	10.9			0.4	0.1	
Near Eastern Studies	32.8	25.3	55.1		5.2	207.9			143.8	5.5	8.3	3.5	68.3		
Peter B. Lewis Center - Arts							10.6					2.6			
Philosophy			1.4	80.0	13.9				21.5			11.1	13.2		1.9
Religion		6.4	93.7	37.6			30.0		5.7	81.4	24.4	3.1		0.4	

*Does not include PPPL or Graduate School Fellowships
Depts/Programs in Blue not included in the Averages

Appendix 2

Costs Associated with the Committee's Recommendations

In this Appendix, we provide cost estimates for the recommendations described in this report. To put the Committee's recommendations in a larger context of resource needs, if the two highest-priority recommendations were implemented, they would amount to $11.9M/year, approximately 6% of campus annual sponsored research expenditures. $11.9M/year is equivalent to the payout on a $240 million dollar endowment. The University provides a subsidy of approximately $33M/year in support of research infrastructure§. Thus, the top two recommendations would amount to an increase of the central subsidy to sponsored research of approximately (12/33=) 36 percent¶.

A.2.1 Faculty Research Funds

The Committee recommends making 5 new awards per year in each category:

- 5 new Scientific Innovator awards per year (each $150K/year, lasting 4 years)
- 5 new Exceptional Accomplishment awards per year (each $150K/year, lasting 4 years)
- 5 new Proposal Preparation awards per year (each $50K, lasting 1 year)
- 5 new Proposal Matching awards per year (each $75K/year, lasting 3 years)

The associated steady-state expense is $7.4M/year, approximately 3.7% of campus annual sponsored research expenditures. Equivalently, this corresponds to the payout on an $148 million endowment, or a 22 percent increase in the central subsidy to sponsored research activity.

A.2.2 Graduate Student Tuition

There are currently approximately 200 4th and 5th-year graduate students supported by sponsored research who qualify for tuition cost-sharing. The current tuition cost-share amount is $22.675K for students on grants carrying full facilities and administration (F&A) costs. This represents 50% of tuition cost-sharing, with the other half being provided by the University.

§ In order to recover the full costs associated with research infrastructure, the facilities and administration (F&A) cost recovery rate would have to be ca. 79% (Office of Finance and Treasury, 2011 Cost Study). Because of federal caps on indirect cost recovery and the fact that not all grants are charged indirect costs, the effective indirect cost recovery rate is approximately 45% of direct research expenditures. The central subsidy of ca. $33M/yr is aimed at covering this gap. Even in the absence of federal caps, a central subsidy would be needed in order to shield Principal Investigators from unsustainable F&A costs.

¶ Central funds support the research enterprise in other important ways not explicitly tied to sponsored research. Examples include startup funds that enable new faculty members to purchase research equipment and support graduate students, and research funds that are occasionally provided to faculty members who are considering offers form other institutions. This type of support, though vitally important, is not explicitly tied to sponsored research. Accordingly, we choose to use only that portion of central funds that is explicitly tied to sponsored research as a metric against which to quantify the committee's recommendations when placing them in a broader context of resource needs.

The cost associated with covering 4th and 5th-year tuition expenses is therefore $4.5M/year, approximately 2.25% of campus annual sponsored research expenditures. Equivalently, this corresponds to the payout on a $90 million endowment, or a 13 percent increase in the central subsidy to sponsored research activity.

A.2.3 Graduate Student Fellowships

The Committee recommends that the University undertake a long-term effort aimed at raising resources for competitive 3-year graduate fellowships, each to cover the 2nd, 3rd, and 4th years. Each graduate student fellowship costs the University $51K/year[§]. The endowment needed to support a single fellowship, assuming a capitalization rate of 5%, would be $1M.

A.2.4 Capital Equipment for Shared Facilities

The approximate value of shared facility capital equipment in CHM, MOL, PHY, PRISM and PICSciE is $60M. Assuming a 10% rate of depreciation, an investment of approximately $6M/yr is required to replace this equipment.

The Committee recommends a yearly competition – including proposals for departmental contributions -- for capital equipment purchases, open to academic department units that manage shared facilities.

A.2.5 Allowing Deferral of First-Year External Fellowships

The Table below summarizes the current (non-defer) and proposed (defer options) for a graduate student who is a recipient of an NSF or equivalent 3-year Fellowship.

	Defer		**Non-Defer**	
Year	**Status**	**Central Funds**	**Status**	**Central Funds**
1	Reserve[a]	Tuition[a] + Stipend	Tenure[b]	Tuition[b] + Prize
2	Tenure[b]	Tuition[b] + Prize	Tenure[b]	Tuition[b] + Prize
3	Tenure[b]	Tuition[b] + Prize	Tenure[b]	Tuition[b] + Prize
4	Tenure[b]	Tuition[b] + Prize	AR[c]	½ Tuition
5	AR[c]	½ Tuition	AR[c]	½ Tuition
Total		**$203.5K**		**$154.4K**

[a] Student on University 1st-year Fellowship. Central funds contribute full tuition ($ 45.35K) and stipend ($26.45K).
[b] Student on external fellowship (e.g., NSF). Central funds contribute tuition minus "cost of education" ($32.35K) and prize ($4K).
[c] Student supported on external grant carrying full F&A costs. Central funds contribute half tuition ($22.675K).

The additional cost per student associated with 1st-year deferral of an external fellowship is $49.1K.

[§] Stipend plus half tuition

Appendix 3

Sustainability of Life Sciences Research

A recent article by leading biomedical scientists has called into question the sustainability of the US biomedical research enterprise as currently configured[¶]. The influential article, which has already been cited more than 75 times, traces the origin of the current "hypercompetitive" environment in life sciences research (see Appendix 1 for detailed data) to the assumption that "the biomedical research system in the United States will expand indefinitely at a substantial rate." The abruptly stalled expansion of the NIH budget[‡] is the clearest indication of the flawed nature of this assumption.

Because the report's analysis and recommendations have broad implications for the entire US biomedical research enterprise, including Princeton, and because the authors (including Princeton's 19th President, Shirley Tilghman) are highly regarded thought leaders in their field, in this section we address the article's diagnosis and prescriptions, from a Princeton perspective.

Table III lists the proposal success rates for Princeton life sciences departments over three-year periods spanning the last 16 years. It can be clearly seen that the success rates are consistently well above the NIH national average (see Figure 5, Appendix 1).

Table III: Proposal success rates (%) in Princeton Life Sciences departments and the Princeton Neuroscience Institute

	99	00	01		06	07	08		11	12	13
MOL	45	52	37		27	27	44		35	35	35
EEB	38	54	73		46	39	31		19	44	24
PSY	31	44	56		34	44	36		33	36	55
PNI[a]	n/a	n/a	n/a		100(3)	100(1)	0(4)		33(15)	45(19)	29 (28)

[a] Numbers in parenthesis are the total number of proposals submitted through PNI in each year.

Another key indicator of the health of the life sciences research enterprise at Princeton is graduate student placement statistics. Over the 2005-2015 period, 208 graduate students earned a Ph.D. degree in Molecular Biology. Only 7 among these graduates are not currently employed, a 97% placement record[§]. 34% of the graduates are in post-doctoral positions, 36% are in industry, 11% hold faculty positions, 5% are in medical school, and 11% work in consulting or in the financial industry.

Thus, both the success of our faculty in competing for government grants and the placement statistics for MOL graduate students suggest that while the external stresses are significant, life sciences research at Princeton is not unsustainable. The stresses and challenges that the Committee's recommendations are intended to

[¶] Alberts, B., Kirschner, M.W., Tilghman, S., Varmus, H. *Rescuing US biomedical research from its systemic flaws*, *Proc. Nat'l. Acad. Sci. USA*, *111*, 5773 (2014).

[‡] See Appendix 1, Figure 3.

[§] MOL 10-year survey. E. Paine, private communication.

address, however, are especially urgent ones in MOL. The above indicators are being continuously monitored for signs of stress, and the above assessment will have to be revised should the numbers indicate a different picture. At the present time, it is safe to say that Princeton finds itself in a comparatively strong position to face the external and very real stresses stemming from flat or declining NIH budgets and a hyper-competitive and risk-averse environment for sponsored research.

We now address the Alberts *et al*. diagnosis and prescriptions in light of the Committee's recommendations. According to the article, the mismatch between the continued growth in the US biomedical research workforce (faculty, post-docs, graduate students) and the abrupt end, around 2003, of NIH's budget growth has created a "hypercompetitive" environment, with proposal acceptance rates in the low teens. The consequences of this environment include[¶]:

- risk-aversion in proposal writing and evaluation, favoring applicants who can "guarantee results" over those with "path-breaking ideas that, by definition, cannot promise success";
- inflated value being accorded to "translational research" that is closely linked to medical practice, to the detriment of basic, fundamental research;
- increased time pressure on investigators, who must spend more of their time writing proposals;
- increased time pressure from an expanding regulatory burden; lengthening of time elapsed between PhD completion and starting an independent research career (with at least two 4-year post-doctoral appointments being now *de rigueur* before starting an academic career);
- lengthening of time elapsed before an independent investigator obtains his/her first federally-funded research grant (the average age at which PhD recipients receive their first NIH grant is now approaching 42).

The article's recommendations are:

- planning for predictable and stable funding for scientific research;
- moving gradually towards a system in which graduate students are supported on fellowships and training grants rather than with research grants;
- broadening the career paths for young scientists, beyond academia;
- increase the compensation for federally-funded post-doctoral fellows and limit the number of years during which post-doctoral fellows may be supported on federal research grants;
- increase the use of staff scientists at the expense of post-doctoral fellows;

¶ In addition to those listed herein, the Alberts *et al*. piece identifies consequences that are specific to medical schools, and are therefore not addressed in this report.

- make wider use of grant mechanisms that provide stable support for outstanding investigators across a range of career stages (e.g., Howard Hughes Medical Investigators);
- increase the number of awards that favor originality and risk-taking, without requiring extensive preliminary results;
- incorporate sunset provisions into all new programs and team efforts;
- put mechanisms in place that would allow agencies to factor in the total amount of dollars granted to individual laboratories before increasing their support for any given laboratory;
- improving grant evaluation criteria so as to discourage reliance on formulaic metrics (e.g., number of publications) and encourage instead consideration of qualitative aspects of a candidate's main accomplishments, placing higher priority on quality, novelty and long-term objectives than on technical details;
- adjusting grant review guidelines for young scientists so as to favor and encourage proposals that reveal ingenuity and promise findings with potentially broad implications;
- strengthening review panels.

One of the Committee's major recommendations (Faculty Research Funds) is precisely intended to address three of the problems identified by Alberts *et al.*:

- *Risk Aversion*: The Scientific Innovator Fund is designed to reward risk-taking, innovative research and path-breaking ideas by young faculty members.
- *Increased Time Pressure due to Proposal Preparation*: Innovation fund proposals will be short (2-3 pages).
- *Lengthening of Time Before Independent Investigator Obtains His/Her First Federal Grant*: The Scientific Innovator Fund will provide young investigators with four years of predictable and stable funding. Among other things, this will greatly facilitate obtaining preliminary results that can make proposals to federal agencies more competitive.

Two of the Committee's major recommendations (Faculty Research Funds, Graduate Student Support) are precisely intended to address six of the recommendations by Alberts *et al.*:

- *Predictable and Stable Funding for Scientific Research*: Both the Scientific Innovator and Exceptional Accomplishment Funds will provide four years of substantial, predictable funding to a substantial number of junior and senior faculty members.
- *Moving gradually towards a fellowship and training-grant system for graduate student support*: The Committee is recommending that Princeton undertake a long-term effort to very substantially increase the number of graduate student fellowships, to an extent that will prove to be transformative.

- *Make use of grant mechanisms that provide stable support for outstanding investigators across a range of career stages*: This is precisely what the Scientific Innovator and Exceptional Accomplishment Funds are intended to accomplish. Each will provide four years of substantial funding to outstanding junior (Scientific Innovator) and senior (Exceptional Accomplishment) faculty members. In one case, the funds will reward bold, path-breaking, risk-taking ideas; in the other, a proven record of outstanding accomplishment in original research with a sustained focus on innovative thinking.
- *Increase the number of awards that favor originality and risk-taking, without requiring extensive preliminary results*: This is precisely what the Scientific Innovator Fund is designed to do.
- *Improving grant evaluation criteria so as to discourage reliance on formulaic metrics (e.g., number of publications) and encourage instead consideration of qualitative aspects of a candidate's main accomplishments, placing higher priority on quality, novelty and long-term objectives rather than on technical details*: This is precisely the way in which both the Scientific Innovator and Exceptional Accomplishment proposals will be judged: emphasis on originality of ideas and risk-taking (Scientific Innovator) and on accomplishments in original research and long-term objectives (Exceptional Accomplishment).
- *Adjusting grant review guidelines for young scientists so as to favor and encourage proposals that reveal ingenuity and promise findings with potentially broad implications*: This is precisely how Scientific Innovator proposals will be judged.

In sum, Princeton has an extraordinary faculty, who are able to compete very successfully for federal funding for their research. Our graduate students receive outstanding training and are able to find jobs across a broad spectrum of sectors, with significant numbers entering careers beyond academia. While the nationwide stresses affect Princeton's life sciences departments (e.g., flat agency budgets, declining purchasing power of grants), and some of the corrective actions recommended by Alberts *et al*. could be quite beneficial to our faculty, post-docs and graduate students (greater career path diversity, limiting the total length of post-doctoral appointments), the life sciences research enterprise at Princeton is not unsustainable. It is in fact thriving, stresses notwithstanding. And several of the key recommendations of Alberts *et al*. would in fact be implemented if the Committee's recommendations are too.

The considerable stresses affecting federally-funded research in general (and life sciences research with greater intensity) in fact provide an excellent opportunity for Princeton to capitalize on the extraordinary quality of its faculty, supplemented by selective investments such as are recommended herein. There is a real possibility that this could place Princeton at a considerable competitive advantage vis-à-vis its peers. Now is not the time to retrench. There has hardly been a more exciting time in the life sciences. The Committee strongly believes that Princeton is poised to play a leading role in defining the frontiers of knowledge for the life sciences in the 21st-century, provided the right investments are made, and provided that the current moment is seen as an opportunity rather than a threat.