Executive Summary
The University Central Discovery Grant (DG) Program is designed to enhance the research programs of faculty members in University Central schools by providing seed funding to establish cooperative and interdisciplinary research programs, stimulating the development of new ideas and areas of research, and developing necessary infrastructure. By doing so, the DG Program aims to place faculty members who receive awards in the best position possible to compete for the extramural funding needed to carry out their research. The program was launched in late 1998 by the Office of the Provost and has been administered since 2000 by the Office of the Vice Provost for Research and Dean of the Graduate School.

In 2007, the Vice Provost’s Office issued a report which outlined the history of the program to date by providing an analysis of its first nine years (1999-2007) of operation. During that period the program received 215 submissions totaling $15.4 million and made 128 awards, totaling $7.9 million. Almost 440 faculty were involved in those submissions (some more than once), with 147 individuals serving as lead PIs.

As part of the 2007 analysis, we surveyed the 60 faculty PIs who received awards in 1999-2005 and whose award periods had ended. Awards are typically made for two years and PIs often request and receive extensions, so any PI whose grant was still ongoing was not asked to respond. Our office received responses from 59 of those 60 PIs, and the results were impressive. Taken as a group, their $3.5 million in DG awards had led to 86 externally funded grants totaling just over $34 million – a nearly ten-fold increase over the initial support. Complete results are available in the 2007 report, posted on-line.

That said, the data for the first few years (1999-2001) were incomplete. In addition the initial survey responses were not captured consistently. Therefore in fall 2012, as the program approached its 15th year, the vice provost felt it would be valuable to have a more comprehensive analysis and an updated survey. The present analysis focuses on 2002-2012, includes complete information on submissions, awards, and faculty involvement, and provides accurate year-to-year comparisons. As with the earlier report, this follow-up survey includes only the PIs of 2002-2010 DG awards – again, to ensure we looked at completed awards.

For both the analysis and the survey, there is of course some overlap with the earlier report. There is no question that the program remains extremely popular and if anything continues to exceed expectations with respect to seeding new collaborations and research initiatives and generating significant external support for Vanderbilt faculty and students.

1 Available on the Internal Grant Submissions website: http://research.vanderbilt.edu/policy/internal-grants/.
2 All years, unless otherwise noted, are fiscal years.
Analysis: Submissions and Awards, 2002-2012
For the period 2002-2012, the program received 335 proposal submissions representing $24.6 million. While the average number of submissions each year is 30, the actual number submitted has generally trended up over the course of the program. In September 2012, our office held its first workshop on both the Discovery and Research Scholar Grant programs, as part of the Faculty Development series hosted by the Vice Provost for Faculty and International Affairs. The workshop was well-attended by faculty at all ranks and helped dispel a number of myths about both programs, including the perception that senior faculty were not eligible to submit, and that the same review committee made recommendations from year to year.\(^3\)

Whether because of the workshop, or concerns over tightening Federal funding and department budgets, 2012 submissions were the highest ever (40) and represented the largest single-year request for funding ($3.2 million) in the program’s history.

![Number of Proposals Submitted and Awarded (2002-2012)](image)

The number of awards has remained relatively constant, as has the amount available for awards. Since 2003 the DG program has awarded just under $1 million per year, until 2012. In that year the Provost’s Office provided some additional funds, which accounts for the uptick in both the number and dollar value of awards for that year.

\(^3\) For more information, see External and Internal Reviews, pg. 8.
The success rate over the 11-year period has fluctuated significantly, from the high of 73% (2003) to the low of 34% (2007). The average of 50% is significant, given the overall success rate for NIH research project grants in 2012 was 18%, and NSF’s estimated success rate for 2012 was 22%. It is interesting that without intervention from our office, the number of DG submissions hovers around twice the number of awards – competitive, but not discouragingly so.

Proposal submissions over the time period have been divided roughly equally between the most popular of the three funding categories, Pilot/Feasibility Studies (max $50,000 for two years)

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and *Interdisciplinary Grants* (max $100,000 for two years). Pilot studies are most often submitted by individual PIs, and are intended to enable investigators to perform key preliminary investigations or studies in new areas of research to prepare them to submit new external grant applications. Interdisciplinary proposals support two or more faculty from different fields, generally different departments or schools. The third category, Infrastructure Grants, supports acquisition of equipment and requires significant matching as a condition of the proposal.

![Bar chart showing Submissions and Awards by Program Category 2002-2012](chart.png)

Just over half of all awards made in this study period have been for pilot or feasibility studies. There are no formal guidelines favoring one category over another; proposals are reviewed for quality and rank-ordered by the internal review committees. Awards are made each year until the available funds are exhausted.

![Bar chart showing Submissions and Awards by Program Category 2002-2012](chart2.png)
Faculty Involvement
Full-time tenured and tenure-track faculty members working in fields with opportunities for securing substantial, ongoing extramural support are eligible to submit proposals. Proposals may involve investigators in the Medical Center, but the principal investigator must be based in University Central. Any faculty member’s proposal participation in a given year is limited to two submissions, only one of them as principal investigator. In 2002-2012, almost 700 faculty members from every school except Divinity – including 129 from the Medical Center (as co-PI only) – participated in the submissions as principal investigator (PI) or co-PI.

Not surprisingly given the relative size of the schools, almost half of the submissions and 55% of the awards went to PIs in Arts and Science, although Engineering has consistently been strongly represented. This comparison by the PI’s school is only part of the story, given the number of faculty who participate on submissions; Engineering faculty participate as co-PIs on A&S-led grants, for example, and vice versa.

Faculty members from every department in Engineering and Peabody, and from every CAS department with external funds, have submitted at least one proposal to the DG program. In addition some of the humanities departments in CAS have also submitted proposals, although not every department that has submitted has received an award.

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6 School is defined by the PI’s home department.
CAS has averaged an almost 60% success rate; Engineering, 42%; and Peabody, 33% (calculated only on those years Peabody faculty submitted proposals to the program).
The same six departments are responsible for the largest number of submissions and awards, although the order shifts slightly between submissions and awards. In both categories, Biological Sciences and Electrical Engineering and Computer Science have the most submissions and awards.
Several departments have bested the program’s overall average success rate, as noted below; all other departments have success rates of 50% or less.

Every year a number of VUMC faculty (including the Schools of Medicine and Nursing) are involved in submissions and awards, the vast majority in the Interdisciplinary funding category. Overall, 28% of submissions and of awards each year for 2002-2012 have included almost 130 VUMC faculty.
External and Internal Reviews

External peer review continues to be a critical component of the Discovery Grant program. Each proposal submitted for review receives a minimum of two external reviews, and in many cases three or four, which help inform the internal review committees’ discussions and assist them in ranking the submissions. The external reviewers’ comments (redacted as appropriate) are provided to the PIs, regardless of whether or not the DG submission is funded. Those reviews offer invaluable feedback to strengthen future resubmissions, both internal and external.

This guerilla marketing is remarkably successful; the external reviewers all generally praise the quality of the submissions and the invaluable nature of the seed funding provided by Vanderbilt to its faculty. The analysis completed in Fall 2007 included in its appendices a list of representative quotes from external reviewers.

The external reviews are provided to the members of the internal review committees, who assist the vice provost in rank-ordering the proposals. The internal committees are comprised of senior tenured faculty members with knowledge of the disciplines represented by the submissions. There are no standing review committees; the internal review committees are constituted each year, and no one listed as a PI, co-PI, or major user on a submission serves as a reviewer for that submission, although it is possible that faculty members may repeat as internal reviewers. The internal review committees are chaired by the vice provost and staffed by the assistant provost. Faculty who serve on the internal review committees, like the external reviewers, remark on the variety and quality of research being proposed by their colleagues.

Survey: Completed Awards, 2002-2010

In September 2012, PIs who received DG awards from 2002 through 2010 were surveyed and asked to respond for each of the awards they received in that time period. Some of these PIs
responded to the initial survey in 2005-2006; but since that was completed, some have left, and several new PIs have participated in the program since then.

One of the main criteria for awarding a Discovery Grant is the probability that, if funded, the proposed project will lead to external funding. Additional criteria include support for graduate and (to a lesser extent) undergraduate students, and impact on the field. As with the earlier survey, PIs were asked to provide the following information for each DG award:

- A list of refereed journal articles resulting from the DG-funded work;
- If external funding was received based on the work, the title, amount, and period of the external award; the PI and co-PIs; the funding agency; and the number of students supported; and
- Any commercialization activities resulting from the DG funding.

For the period 2002-2010, 131 grants were awarded to 108 individual PIs. Of those 108 PIs, 79 are still at Vanderbilt and active as of April 30, 2013. Seven of the original 108 have retired, and the other twenty-two are no longer here for a variety of reasons. Those 79 active faculty PIs represent 101 awards. Following three requests over September 2012 – January 2013, we received responses from 65 of those PIs, an 82% response rate. They account for 85 (84%) of the 101 awards.

The phrase “return on investment” is misleading when discussing the outcomes of almost a decade of DG investments, because there is a mushrooming effect. Faculty continue to expand research activities built on preliminary data generated by DG awards, collaborations launched with DG funding continue to be productive, and graduate and undergraduate students and postdocs supported by these efforts complete their studies and go on to develop their own research careers and support their own students. There is no clear way to fully quantify the benefits the DG program provides. Nonetheless, as with the initial survey, the results shared by the faculty are impressive.

The 65 PI respondents received slightly over $4 million in DG awards, for the period 2002-2010. They reported receiving 130 external awards from proposals based in some part on their Discovery Grant proposals. Of the 130 external awards received, PIs provided financial data on 128 of them – totaling an impressive $120.4 million in external funding, a 2,870% increase over the initial $4.05 million in internal funding, or an almost 2,900% return on investment.

As a point of comparison, for the survey covering 1999-2005, 59 PIs representing $3.5 million in DG awards reported receiving just over $34 million in external funding through 86 externally funded grants. Several of the PIs who reported for the earlier survey provided updated information for this survey; clearly the preliminary results achieved through DG support have continued to pay dividends over time.

As in the previous survey, Federal agencies provided the majority of external funding – 94 of the 128 for which we have details, or 73% of the total awards and 82% of the funding. (This is a slight underrepresentation of Federal support, since there are two Federal awards included in the “Other Funders” category.) Not surprisingly, NIH and NSF are the largest single external
funders, accounting for 70% of the funding (39% and 31% respectively). NIH’s prominence reflects the life-science emphasis in much of the research funded by the DG program.

Compared to the 1999-2005 survey, however, the average reported award from NIH has decreased ($930,120 for 2002-2010 vs. $1.03 million for 1999-2005), while the average award from NSF has increased ($1.12 million vs. $259,271). Equally interesting is that private foundations are now the third-largest external funder, behind NIH and NSF, thanks to a small number of seven-figure grants (and one eight-figure grant) from the Gates and MacArthur Foundations and several smaller grants from other private foundations.

Obviously more external awards have been received during the longer time period surveyed, but another interesting difference between the earlier survey and the current survey is reflected in the size of individual awards. During 1999-2005, 55% of awards received were under $250,000. During 2002-2010, 63% of awards were over $250,000, and 24% of them were over $1 million.
In addition to external funding generated from the DG awards, PIs reported those external awards supported at least 190 graduate students, 34 undergraduates, and 11 postdocs. They provided citations for 283 articles in refereed journals generated from the work done with the DG awards, vs. 194 articles for the previous period, and noted 15 patents or patent applications. Several PIs also mentioned multiple conference proceedings, published books, and international collaborations. For 1999-2005, faculty reported 125 graduate students supported (we did not ask for data on undergrads or postdocs), 194 refereed journal articles, and nine patents.

On average, then, for 2002-2010, each DG award led to two external awards representing almost $1.7 million in external funding which supported 1.5 graduate students, and produced four articles.

As impressive as these data are, they clearly understate the impact of the Discovery Grant program for a number of reasons. For those PIs who responded, many indicated additional external grant submissions in review or pending official notification of award, additional articles pending publication or under review, and ongoing conversations with fellow collaborators about additional research. And we do not have results from all the PIs funded during this period.

**Program Impact**

PIs were also asked to provide a short, one- to two-paragraph statement with their assessment of the value of the DGP, the impact it had on their research, and any particular accomplishments made possible by DG support. Every faculty member who responded expressed appreciation for the program and the support received, regardless of the outcome of their project, and emphasized the enormous value the program provided to them, their colleagues, and the institution. The comments often extended far beyond the requested “short” statement and are universal in describing the benefits and impact of the program. Reproduced here is a small but representative sample of the faculty responses.
• The DGP was instrumental for me as a junior faculty to get my research off the ground. Applying for the DGP gave me important grantsmanship “practice” and also provided an important, extra round of peer review before submitting to NIH. Being awarded the DGP also provided motivation to build an interdisciplinary team… [that] has resulted in a strong, ongoing collaboration… While the initial money was important, catalyzing this interaction was probably even more significant, and I anticipate that our partnership will provide sustainable, extramurally-funded research activity for many years to come.

• …critical in establishing sufficient preliminary data needed to win two NIH R01s… provided both important funds and perceived legitimacy for a series of experimental studies that we envisioned… without this type of support, it would have been difficult to fund the studies and, moreover, it may have been challenging to justify (to both our department chairs and ourselves) the time commitment necessary to pursue a new research direction… (emphasis included).

• This Discovery award had a profound impact on my development as a junior faculty member. First, I received this award before I had received any external awards. This was a great confidence builder for me at a time when most of my other grants were being declined. Second, it allowed me to pursue a high-risk/high-reward project without having to invest a substantial portion of my limited start-up funds. The investment paid off, in my mind, as it has led to several publications and to external support from both NIH and NSF. We are, in fact, still reaping the benefits as the methods developed under this award are now used regularly in my lab.

• [One] value added by the DGP is the opportunity for faculty to “refresh” their research interests or approaches. One of the challenges for faculty research… is that both the “hot topics” and the approaches to test hypotheses change throughout their professional careers, which in most cases is several decades… This requirement accelerates as the faculty member continues research, exacerbated by accelerating competing demands on his/her time for teaching/mentoring, paper/grant-writing, travel, responsibilities to the department, institution and the larger scientific community. It is not surprising that some senior faculty gradually lose the edge in research, but the DGP provides an opportunity… to pursue an intriguing side observation, or take a chance on a cool new approach to develop preliminary data that will fire up a competing renewal grant application.

• The Discovery Grant Program has been especially valuable in two ways: (1) It has facilitated the development of new research collaborations across departments and faculty at Vanderbilt and (2) it has facilitated the development of new research directions and established new expertise for funding opportunities. Prior to the DG funds [provided] to collaborate on this research, there were no direct interactions [between two departments]. These projects are the first formal collaborations between the departments in historical memory. Beyond the DGP research itself, the collaborations have also led to the sharing of lab resources, jointly serving on thesis committees, and organization of joint symposia…The net effect of this interdisciplinary DGP research has been to build strong,
multifaceted relationships where none had previously existed between the two departments.

- Overall… the Discovery Grant program is a great investment because it has a positive impact on the expansion of the scientific breadth of this university’s research laboratories… a number of graduate and undergraduate students benefited from the award I received and the … grants that ensued. Awards received by my undergraduate students include the Founder’s Medal; Vanderbilt’s Phi Beta Kappa research award; Vanderbilt’s award for outstanding research in biological sciences; and a travel award from the American Society of Parasitologists.

- The Discovery Grant mechanism has been an incredible institutional effort at seeding pilot data for larger extramural applications. To my knowledge, the size of the awards are larger than other institutions which allows for more robust efforts to collect preliminary findings. The emphasis on innovation and interdisciplinary research has led investigators to (a) forge new collaborations… and (b) have the opportunity to test high reward, high risk ideas. It has been a unique program and Vanderbilt is better off as a result of the DG system.

- The seed funding that the DGP provided helped an interdisciplinary group of faculty here – with nothing but an idea – to launch an internationally recognized research stream that has resulted in Vanderbilt being widely known as one of the premier institutions doing law and neuroscience research… we are most grateful, and have never forgotten the roots of this success. That Vanderbilt’s DGP would take a chance on us and fund our initial study has made an enormous difference.

Changes to the Program
As successful as the Discovery Grant program has been, those of us involved in administering the program felt it would benefit from some modifications. These modifications grew in part out of discussions with senior faculty who have served on the multiple internal review committees, and from discussions within our office. These changes were announced in September 2012 and implemented with the 2012-2013 competition:

- First-year progress reports are now required at the end of Year 1, and Year 2 funding may be contingent on submission of Year 1 reports.
- Faculty currently serving as PI or participating co-PI on one or more active DG awards are not eligible to submit another DG proposal, either as PI or co-PI, until their current DG award(s) have been completed and all reporting requirements met.
- It has now been made clear that awards are based partly on need. Each participating faculty member is required to disclose existing external funding for the most recent five years (which was always required), and institutional resources available in the form of start-up funds or other discretionary research funds. All institutional research-support funds must be included, including endowed-chair funds, annual allocations, fixed-price contract surpluses, and other such sources.
• For Pilot/Feasibility Studies, high-risk proposals with the potential to make significant breakthroughs are now explicitly encouraged.

These modifications did not appear to create a significant barrier for faculty, although we have not yet reached the deadline for Year 1 reporting. We will be in a better position to evaluate the impact of the changes, once we have received and reviewed those reports.

Conclusion
The Discovery Grant program, representing a modest annual investment, has over time seeded extraordinary results. It has supported hundreds of faculty across a wide range of disciplines, incubated new research programs and collaborations, enabled hundreds of students and postdoctoral scholars to advance their studies, and generated millions in external support for the institution. It has helped enhance Vanderbilt’s reputation, extending its impact and reach, and it has generated tremendous goodwill among the faculty. It continues to be a signature program for the institution and is worth sustained support for years to come.