**History**

The University Central Discovery Grant (DG) Program was initiated in fall 1998 (as the University Central Intramural Discovery Grants Program), and was conceived as a complement to a similarly focused program initiated in the Medical Center at about the same time. It was designed to provide seed funding to establish cooperative and interdisciplinary research programs, and to develop the infrastructure necessary for research, and was and still is open to all full-time tenured and tenure-track faculty, and faculty holding equivalent ranks in the Blair School of Music. The focus is on proposals that demonstrate the strong possibility of obtaining external funding to provide long-term support for research initiated through the DGP.

The idea when these programs were launched was that both the DG program and the Medical Center program would emphasize interdisciplinary research, including research that involved investigators from both VUMC and University Central, and would provide increased incentives for interdisciplinary research and increased cooperation between faculty in the Medical Center and University Central. Both programs allowed for joint projects to be submitted, either via the Medical Center or University Central, and the intent was that such projects that were approved would be funded jointly.

In its initial implementation, the program awarded grants of up to $50,000 per year for two years, and for 1998-1999 and 1999-2000, awards were made twice each year. The first year $500,000 committed for awards came from the University Flexibility Fund, and funding was increased to $1,000,000 the following year and thereafter. Beginning with fiscal year 2003, $5 million ($1 million/year for five years) was allocated for the Discovery Grant program from the Academic Venture Capital Fund. Fiscal year 2007 represented the final year of this $5 million investment. Since 1998, the DG program has awarded a total of $7.9 million to faculty across the institution.

Preliminary screening of preproposals was done by an internal review committee. Final proposals – those which passed the preliminary screening – were peer-reviewed outside the university. Over time, the external peer review process, while labor intensive, has proven to be one of the most successful elements of the UC program.

Beginning with the 2001-2002 competition, Associate Provost Dennis Hall modified the program slightly, creating a single competition and eliminating the preproposal phase. Applications are submitted in the fall, with both internal and external peer review, and awards are announced in the spring of the following year. Categories of support are Interdisciplinary Grants (up to $50k/year for two years to faculty in different fields); Pilot/Feasibility Studies (up to $25k/year for two years to faculty within the same discipline); and Infrastructure Grants (up to $100k/year for two years).

**Data**

Data for the first three years of the program – 1998-1999, 1999-2000, and 2000-2001 – are incomplete. What data are available apply to awarded proposals only, with some anecdotal evidence as to the
number and dollar value of submissions. More complete analysis is available beginning with 2002 through 2007.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number submitted*</th>
<th>Number awarded</th>
<th>Awarded to Submitted</th>
<th>$ Value Submitted*</th>
<th>$ Value Awarded</th>
<th>$ Value, Awarded to Submitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999*</td>
<td>7</td>
<td>7</td>
<td></td>
<td>$769,915</td>
<td>$557,324</td>
<td></td>
</tr>
<tr>
<td>2000*</td>
<td>15</td>
<td>14</td>
<td></td>
<td>$1,014,611</td>
<td>$886,059</td>
<td></td>
</tr>
<tr>
<td>2001*</td>
<td>22</td>
<td>17</td>
<td></td>
<td>$1,369,569</td>
<td>$956,434</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>17</td>
<td>11</td>
<td>64.7%</td>
<td>$1,155,795</td>
<td>$637,209</td>
<td>55.1%</td>
</tr>
<tr>
<td>2003</td>
<td>26</td>
<td>19</td>
<td>73.1%</td>
<td>$1,903,697</td>
<td>$983,000</td>
<td>51.6%</td>
</tr>
<tr>
<td>2004</td>
<td>28</td>
<td>15</td>
<td>53.6%</td>
<td>$1,971,026</td>
<td>$975,899</td>
<td>49.5%</td>
</tr>
<tr>
<td>2005</td>
<td>37</td>
<td>17</td>
<td>45.9%</td>
<td>$2,608,668</td>
<td>$985,000</td>
<td>37.8%</td>
</tr>
<tr>
<td>2006</td>
<td>28</td>
<td>16</td>
<td>57.1%</td>
<td>$1,999,965</td>
<td>$988,187</td>
<td>49.4%</td>
</tr>
<tr>
<td>2007</td>
<td>35</td>
<td>12</td>
<td>34.3%</td>
<td>$2,615,215</td>
<td>$975,511</td>
<td>37.3%</td>
</tr>
<tr>
<td>Total</td>
<td>215</td>
<td>128</td>
<td>59.5%</td>
<td>$15,408,461</td>
<td>$7,944,623</td>
<td></td>
</tr>
<tr>
<td>Average (2002-2007 only)</td>
<td>29</td>
<td>15</td>
<td>54.8%</td>
<td>$2,042,394</td>
<td>$924,134</td>
<td>46.8%</td>
</tr>
</tbody>
</table>

*Number submitted for 1999, 2000, and 2001 applies to the number of final proposals, but not the total number of preproposals submitted. As such, the data under represent (probably significantly) the actual number of faculty who participated in the first three years and the dollar value of the preproposals submitted. For example, an email from Jack Venable, associate provost at the time, makes reference to approx. 25 preproposals totaling $2.5 million submitted for the inaugural fall 1998 competition.

As the table above shows, the DGP has averaged requests for roughly twice as much support as the program has available, with slightly more than half the proposals submitted being funded. Over the past five years, the total amount requested has trended up, averaging just over $2 million a year, but reaching as much as $2.6 million in 2007 (see below). The amount available to be awarded has remained constant at $1 million.
The number of submissions has also trended up, averaging 29 per year but peaking in 2005 (37) and again in 2007 (35). The number of awards has remained relatively flat, within a range of 11 to 19 and averaging 15 per year over the five-year period.
Below are the statistics for the dollar value of the proposals:

<table>
<thead>
<tr>
<th>Dollar Value of Submitted Proposals</th>
<th>Dollar Value of Awarded Proposals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under $50,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>25%</td>
<td>30%</td>
</tr>
<tr>
<td>Between $50k and $100k</td>
<td>Over $100,000</td>
</tr>
<tr>
<td>15%</td>
<td>12%</td>
</tr>
<tr>
<td>Over $100,000</td>
<td>Under $50,000</td>
</tr>
<tr>
<td>5%</td>
<td>3%</td>
</tr>
<tr>
<td>$100,000</td>
<td>Between $50k and $100k</td>
</tr>
<tr>
<td>27%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Approximately one-third (32%) of the proposals submitted have been for $100,000 or more, while over half (53%) have been for $50,000 or less. The dollar value of proposals awarded skews towards lower grant amounts, with 87% of the awards totaling $50,000 or less, but only 15% of the awards totaling $100,000 or more.

**Faculty Involvement**
All the University Central Schools have been represented among the faculty PIs. Not surprisingly, the majority of submissions based on the home department of the lead PI have come from the College of Arts & Science – just over half. But Engineering and Peabody have been well represented, with 37% and 11% respectively. These proportions carry over into the distribution of awards, as well.
While the only other schools with lead PIs are Blair and Law, Owen and Divinity have not been excluded, with faculty participating on grants as co-PIs.

Interestingly, Medical Center faculty have consistently been involved as co-PIs on an average of approximately 25% of all proposals submitted and awarded (2002-2007). While the University Central program continues to encourage Medical Center faculty as participants in its discovery grants, the Medical Center program does not encourage its discovery grant submissions to include university faculty. VUMC has provided support for selected interdisciplinary and infrastructure grants jointly with the UC program, most recently in 2003.

**Faculty numbers represent total numbers of faculty involved in each year of the program. Many faculty participate in more than one year, either as lead or co-PIs.**

The data show that the DG program has reached broadly across the university. Because we have incomplete data for 1999-2001, the total number of faculty involved – 439 – under represents the actual number of faculty who have participated (this number does include repeat participants). We know that at least 147 individuals have submitted 215 proposals (as lead PI) for the years 1999-2007. Forty-four faculty have submitted two or more proposals, while 103 faculty submitted one proposal. Many who served as lead PI returned in subsequent years as co-PIs with their colleagues.

As would be expected, the science and engineering disciplines predominate among the submissions. The following chart shows the largest number of submissions and awards by home department of the PI:
In terms of proposals submitted and proposals awarded, the top departments in both categories are almost exactly the same. But in addition to the usual suspects (Biological Sciences and EECS, e.g.),
the top departments includes Anthropology. And of the ten departments within A&S represented among lead PIs, we find French & Italian, History, and Political Science joining the hard sciences and Anthropology. All five of Engineering’s departments and all five of Peabody’s departments are represented among the home departments of lead PIs.

Return on Investment
In late 2005, the Office of the Associate Provost solicited feedback from the 60 lead PIs on successful Discovery Grant proposals whose award period was complete, and received responses from 59. The faculty were asked to respond with the following:

- Number of refereed journal articles resulting from DG-supported research;
- External funding received based upon DG-supported research, including
  - PIs and any co-PIs,
  - Amount of the award,
  - Award period,
  - Funding agency, and
  - Graduate students supported by the award; and
- An assessment of the value of the program, its impact on their research, and any accomplishments made possible by the program.

The data should be considered incomplete and under representative of the success of the discovery grants. Responses were inconsistent in terms of dollar amounts of awards (“several” was one response), refereed journals (numerous “in process” or “pending,” e.g.), and graduate students (“2 or 3,” “4 RAs,” “2 post-docs”). It is difficult to be certain that the numbers truly represent the success of the program.

Even with inconsistent responses, the ROI is impressive: The 59 PIs represented $3.5M in internal DG funding, and reported 86 externally funded grants totaling just over $34M in funding as a result of their discovery grant research – an almost 10-fold increase over Vanderbilt’s initial investment. Given that these results were recorded almost two years ago; some of the faculty who reported receiving external grants did not provide details of the grants; and many of the comments included references to pending requests, there is every reason to believe the actual number is far greater.

Likewise, the faculty reported at least 194 refereed journal articles (again, many PIs reported articles “under review,” or in process), 9 patents, numerous book chapters and conference presentations, and approximately 125 graduate students supported on the externally funded grants. Without it being an explicit expectation of the program, several of the PIs reported involving undergraduate students in their research, although we have no concrete data to indicate how many. On average, then, each discovery grant yielded over three journal articles, at least two graduate students, and at least one externally-funded grant of slightly over $436,000.

An analysis of which agencies funded the external research shows that, not surprisingly, Federal agencies comprised the majority of grants (53 of the 78 for which we have details, or 68%) and represented almost all the funding - just under $33.4M of the $34M reported. What is interesting is that the largest funder across all metrics – number of grants, total amount, and average grant size ($1M) – was NIH, perhaps reflecting the influence of collaborators from the Medical Center. The
chart below shows comparisons. Private foundations were the least profitable external funders, providing 20 grants but averaging only $11,196 per grant.

Although slightly more than one-third of the external awards were less than $100,000, almost one-third were over $500,000, as the chart below shows – and two of the grants were $3M or more.
Even with incomplete data, the Discovery Grant program has clearly been worth the initial investment. And while the data may under represent the benefits, the comments from the PIs do not. Appendix A includes a sample of comments from the faculty. *Every* faculty member who responded – even those whose discovery grants did not lead to significant external funding – universally praised the program, its impact, and the value it provided to them individually and to their research.

Among the faculty comments, only three PIs provided concrete suggestions about changes to the program. One recommended requiring a waiting period for successful faculty (five years) before they can reapply; one suggested adding a special competition for female faculty whose scholarship is delayed or interrupted due to childbirth or child-rearing responsibilities; and one observed that there appeared to be institutional barriers to what he considered the most valuable element of the program, fostering University-Medical Center collaborations. (There is a separate effort, jointly sponsored by the Associate Provost for Research & Graduate Education and the Associate Vice Chancellor for Research, to investigate how to reduce such barriers.) Even with such perceived barriers, as noted above Medical Center faculty have continued to participate throughout the life of the Discovery Grant program.

**External Reviews**

One of the continuing successes of the Discovery Grant program is the process of external peer review. Beginning in 2002 (when we have complete data), at least 651 external reviews have been solicited from faculty across the country at a wide variety of institutions, and a total of 509 reviews have been provided – a response rate of 78%.

Appendix B lists a sample of representative comments from the external reviewers, with their home institution listed in parentheses. Edits have been made to mask specific details of the proposal under
review. What these comments demonstrate is a significant tangential return on investment from the program. By engaging faculty at peer and competing institutions across the country, Vanderbilt disseminates evidence of the expertise and research of its faculty. It creates a cadre of advocates for its faculty and programs, who in turn can affect perceptions when asked to rank or comment on programs by private foundations, magazines, and other external sources.

The continuing high response rate, coupled with the overwhelmingly positive responses from the external reviewers, justifies continuing this aspect of the program.

Conclusion
The Discovery Grant program clearly has achieved its initial goals of seeding research, engaging faculty across disciplines, and better positioning VU faculty to compete for new and ongoing external funding. Based on a variety of measures – the number of faculty participants, the breadth of disciplines supported, the significant external funding generated as a result of relatively modest investment, and the comments of both faculty and external reviewers, to name a few – this program is well worth continuing, and if possible increasing the amount of funds available each year. Given the two-to-one ratio of submissions to awards, there is no dearth of well-conceived proposals to be considered.

Prepared by Elizabeth Rapisarda, Assistant Provost, Research & Graduate Education.
Preliminary data gathered by Caroline Lee and Heidi Basgall, Office of the Associate Provost for Research & Graduate Education.
APPENDIX A

SELECTED COMMENTS FROM THE PRINCIPAL INVESTIGATORS

- “I think the Discovery grant program is extraordinary. The reality with … NIH is that you have to have about 70% of the work done in order to make a convincing case for them to fund you. For a new professor or an old one with a new idea, the discovery funding can make it so you have the tools to gather that data.”
- “My Discovery Grant has had an extraordinary impact on my research program… Further, the technology that originated in my group with the Discovery Grant has now proliferated throughout the Vanderbilt campus… Vanderbilt really must continue the Discovery Grant program…. The program gives Vanderbilt a huge strategic advantage.”
- “The NIH award we received was due directly to the successes we had during the period covered by this Discovery Program award.”
- “This discovery grant has played a key role in developing my thinking and acquiring subsequent funding upon arriving here at Vanderbilt… I support this program so strongly that … I have decided to make a donation in the coming year to continue support of this program.”
- “[T]he Discovery Grant Program is essential in making Vanderbilt a competitive university for extramural grant funding… The most important aspect to the program was the freedom in disbursing this semi-unrestricted source.”
- “There are two important functions that the program serves. The first is for faculty members like me… When I came to Vanderbilt and negotiated my start-up, I was unfamiliar with planning to build a laboratory. While the start-up money was extremely helpful, it was quite insufficient. The Discovery Program allowed me to secure my laboratory. The second function is for faculty trying to develop a novel area of research. It is very difficult to expend resources on a novel project when the money for student support and basic materials is not there. The Discovery Program allows these ventures to take place… Vanderbilt needs this type of program to be competitive.”
- “The Discovery Grant program is absolutely critical, especially now considering the funding problems at NIH.”
- “The program was incredibly valuable to my lab. It allowed me to branch out into the study of a new domain, get pilot data necessary to put into a grant proposal which we eventually received… The program allowed [my graduate students] to attack questions that are relatively unexplored in our field, and I would think it should be very beneficial to them when they start their own careers, as they will be able to distinguish themselves from the pack a little more.”
- “The Discovery Grant program was absolutely essential to the success of the early stages of the project… I would rate the program as an unqualified success for my laboratory research effort, and I am certain I would not be funded now without the support of the Discovery Grant Program.”
- “[W]e had little or no prospect of securing external funding without the seed money provided by [this] program. Beyond positioning my lab for the NSF grant proposal… the data and tools generated under this award, as well as the field conditions that these funds made possible, represent permanent resources that will have a dramatic impact on the future funding potential of my lab. In short, I believe that the Discovery Grants program is an extremely wise investment in faculty research.”
- “The availability and flexibility of Discovery Grant funds were thus of great use to me, both in terms of allowing me to secure my first grant, and in providing equipment and materials that will
foster diverse future research... as a strategy for promoting creative research, productive laboratories, and continued external funding, I believe the Discovery Grant program to represent an extraordinarily sound and critically important investment by the University.”

- “This is a very important research program. It allowed collaboration across disciplines which enhanced the ability to compete for a federally funded grant. It provided funding for a graduate student and helped her develop a dissertation topic. It allowed continued work in an area of expertise when there was no other funding available at the time of the discovery grant.”

- “The Discovery Grant Program has had a huge impact on my research... While no additional funding has yet to materialize to fully take advantage of this... work continues to be performed through leveraging of other funds.”

- “Our assessment of the value of the Discovery Grant Program is that is essential for initial seed funding of transdisciplinary research.”

- “[T]he Discovery Grant program is a real boon to research at Vanderbilt. The duration and funding level is very appropriate... it seems to me to be stimulating, encouraging novel or risky research, and cost-effective... This grant *almost* supported an important breakthrough by itself; it didn’t quite, but it nonetheless opened doors to wonderful new research opportunities.”

- “The Discovery grant program is a phenomenal asset to investigators at Vanderbilt... The program provides us with a competitive advantage in developing new research ideas in relation to many of our colleagues at peer institutions.”

- “I can happily say that without the flexibility of the Provost’s office ... we would have had to significantly bootstrap our efforts to date. It is this type of flexibility and subsequent accountability that led to the successful completion of our grant.”

- “In talking with colleagues from other institutions... the largesse of the research support seems unparalleled, making it that much easier for Vanderbilt investigators to collect the data necessary for securing external funding. I sincerely hope this program can continue.”
APPENDIX B
SELECTED COMMENTS FROM EXTERNAL REVIEWS

- “In a sentence, this study is a bargain at 50K.”  (University of Wisconsin)
- “Traditional funding agencies want to see proof of capability before they grant funding… Proof of capability, however, can be achieved only with initial funding… it is precisely this junction… where institutional funding is quite necessary… This is the only weakness of [the PI’s] application, as he requests insufficient funds.”  (University of California, Berkeley)
- “Overall, the line of inquiry that will ultimately be supported by these initial pilot studies promises to be highly innovative… The science ultimately produced by this line of inquiry is likely to be of high impact.”  (Massachusetts General Hospital)
- “It is clear to me that Vanderbilt would do very well in funding this seed effort. There is a very good chance that this will lead to a substantial expansion in the breadth of research effort… Consequently, I am happy to recommend strongly that you support this proposal.”  (Argonne National Laboratory)
- “This is a very strong proposal that should be funded if at all possible. It addresses an important problem that may have long-term implications. The plan of attack is well laid out, the principal investigator is well qualified … collaboration is addressed, and a good support team is in place… In summary, this reviewer strongly encourages funding this application, as the payoff from this relatively small investment could be substantial.”  (Georgetown University)
- “I will put my conclusion up front – the proposed research is innovative, will make an important contribution to the limited literature about [this topic,] and should be competitive in gaining outside funding.”  (Maryland)
- “…this proposal presents the initial description of what may be a very important program of studies which are most worthy of internal university support in their pilot phase.”  (University of Miami)
- “… it is my pleasure to inform you that I find the proposal to be compelling and important, and heartily recommend that you fund it.”  (Harvard University)
- “It is both an honor and a privilege for me to be invited [to review the proposal].”  (National Semiconductor Corp)
- “Accordingly, I evaluate the proposal with high enthusiasm… The proposed work is potentially high-gain, high-profile research, very appropriate for your IDGP funding mechanism… given Vanderbilt’s recent impressive investments in [this discipline], this type of project is exactly how you ought to foster [this faculty member’s] contribution to that initiative.”  (University of Illinois Urbana-Champaign, Beckman Institute.)
- “This is a high quality submission that is remarkable for its in-depth assessment of [this issue]… the best outcome of this investment is that a new investigator … would be launched on an independent research career of her own.”  (Yale School of Medicine)
- “Thank you very much for giving me the opportunity to review the grant proposal… I very much enjoyed reading the proposal and am pleased to be able to comment upon it… I believe that [this project] would make a very good investment for your limited seed money. I strongly recommend that it be funded.”  (University of California, Irvine School of Medicine)
- “[T]his proposal is motivated by an exciting interdisciplinary perspective. Funding this work would bring together researchers from several different backgrounds, and there is substantial
opportunity for synergism in this regard. This kind of interdisciplinary collaboration is very important for obtaining funding from many external agencies.” (Northwestern University)

- “Thank you for giving me the opportunity to review [this proposal]. Also, please accept my apologies for missing the … deadline. I hope that this isn’t reaching you too late to be of some use. Briefly, this is an excellent proposal, and one for which the investigators propose a convincing rationale for internal funding.” (Johns Hopkins)

- “Thank you for asking me to review [this proposal]. I am delighted to be able to endorse it strongly… It definitely represents the state of the art in [its field] and is an outstanding example of interdisciplinary cooperation.” (University of Washington)

- “In summary, I consider this to be an outstanding proposal for the internal … program. Given the significance of the topic, the superb preliminary results, the outstanding team, and the high likelihood for success – both in the technical development and in the acquisition of primary NIH funds – I consider this proposal to be an outstanding candidate for funding.” (Johns Hopkins)

- “The [proposal] is one of the most novel and important concepts that I have come across in [this field]. The proposal is well thought out with careful experiments… The significance of the proposal is very high… I would put this in the top 1% of all proposals I’ve seen.” (MIT)

- “This is an exciting and important proposal that addresses an important clinical problem by using state-of-the-art experimental approaches supported by strong clinical expertise. Funding for this proposal is strongly recommended.” (Children’s Hospital Boston)

- “I strongly support funding this research. I think it is potentially of great value to society in the long term, and to Vanderbilt University (in terms of the likelihood that it will lead to further funding and enhanced reputation) in the near term.” (UIUC, Beckman Institute)