

**FY 2009 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)**

The table below has been completed by program staff.

Date of COV: September 1-2, 2009			
Program/Cluster/Section: Graduate Research Fellowship Program			
Division: Graduate Education			
Directorate: Education and Human Resources			
Number of actions reviewed:			
Awards: 36 (12 year); 2 NRO			
Declinations: 36 (12/yr); 2 NRO			
Other: (Honorable Mentions): 36 (12/yr)			
Total number of actions within Program/Cluster/Division during period under review:			
	Awards	Declinations	Other (honorable mentions)
2007	920	5,444	1,412
2008	913	5,593	1,640
2009	1,244	5,943	1,828
Manner in which reviewed actions were selected:			
GRF: Random sample by disciplinary attributes of total applications			

PART A. INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, and withdrawals) that were *completed within the past three fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

A.1 Questions about the quality and effectiveness of the program's use of merit review process. Provide comments in the space below the question. Discuss areas of concern in the space provided.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE ¹
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Comments:</p> <p>GRFP applications are reviewed by panels.</p> <p>As described in the “Guide for Panelists 2009” panelist instructions are appropriate and comprehensive. The “Guide to Panelists 2009” document encourages panelists to apply both of the National Science Board-approved Merit Review Criteria of <i>Intellectual Merit</i> and <i>Broader Impacts</i>, and to subsequently recommend applicants for fellowship awards. The NSF determines the successful applicants from these recommendations.</p> <p>The “Guide to Panelists 2009” document also clarifies the meaning of the Intellectual Merit and Broader Impacts review criteria. This information helps reviewers who are not familiar with NSF interpret the two review criteria and apply them during review of applications submitted by prospective fellows.</p> <p>Recommendation: Explore the use of new technologies to screen the Q3-4 applicants in order to enhance the face to face interaction/discussion of Q2 applicants.</p>	<p>YES</p>
<p>2. Are both merit review criteria addressed</p>	<p>YES</p>

¹ If “Not Applicable” please explain why in the “Comments” section.

<p>a) In individual reviews? Yes</p> <p>b) In panel summaries? Not Applicable</p> <p>c) In Program Officer review analyses? Not Applicable</p> <p>Comments:</p> <p>The rating template explicitly requires reviewers to address both NSB review criteria by giving applicants a ranking on both criteria and by providing comments on both criteria. Applicants are also given an overall ranking. The GRFP process requires that all applicants describe their qualifications through various means (experience, letters of support, official records, etc)</p> <p>Recommendation: The materials provided to the COV suggest that applicants receive a single overall rating. Rather than give applicants a <u>single</u> ranking that requires reviewers to subjectively weigh the importance of the two NSB review criteria, the COV recommends that reviewers give an overall ranking to each candidate in each of the two NSB review criteria areas and allow NSF to assign the weight to each criterion.</p>	
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<p>3. Do the individual reviewers provide substantive comments to explain their assessment of the proposals?</p> <p>Recommendations:</p> <p>1. In order to make good use of panelists' time, it might be a good idea to "triage" applications before the panel meeting. Applicants who rank in the bottom group should be eliminated from further consideration and discussion prior to the panel meeting so that the panel can spend its valuable time reviewing the competitive applications. This might also allow for smaller panels.</p> <p>2. Providing constructive feedback via written comments can be very helpful for applicants who are not awarded a fellowship. For the applicants that are judged to be competitive but not receiving funding, reviewers might provide comments that are as constructive and extensive as possible given the time constraints.</p> <p>3. Ideally the two reviewers of the panel meeting</p> <p>4. would provide an opportunity for panists to see comments prior to the meeting and avoid conflicting reviews as seen, for example, in the documentation provided for the decline of 1000088091 in which one reviewer commented that the applicant had no prior publications, while the other stated that he/she already had a peer-reviewed journal paper.</p>	<p>YES</p>
<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Comments:</p>	<p>NOT APPLICABLE</p>

<p>Applicants do not receive panel summaries. They receive their rating sheets including comments keyed to the Intellectual Merit and Broader Impacts review criteria.</p>	
<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>(Note: Documentation in jacket usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.)</p> <p>Comments:</p> <p>Review of award jackets indicates that the jacket contains a certification page (signed by the applicant), an award letter (signed by an NSF representative), the application file, and the reviews.</p> <p>The Recommendation Memo (provided by Program Staff to the COV members) contains all of the information traditionally included in a Context Statement. This Recommendation Memo contains a wealth of information that would be useful to program staff who must communicate information to applicants, potential applicants, and others.</p> <p>The Final Selection Report (provided by Program Staff to the COV members) contains a quantitative summary of the results of the program decision-making process.</p> <p>The documentation provided is unclear as to how the decision between award and honorable mention was made (other than budget constraints).</p> <p>Recommendation: It is not clear whether the Recommendation Memo and/or the Final Selection Report is/are provided to applicants and whether or not program staff have ready access to these documents via the internal NSF system. Due to the helpful nature of the information contained within these documents, it would useful to allow as much access to them as is possible and appropriate given their content.</p> <p>Recommendation: The final recommendations to award fellowships or honorable mentions should be documented.</p>	<p>YES</p>

<p>6. Does the documentation to PI provide the rationale for the award/decline decision?</p>	
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<p>(Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written or telephoned with diary note in jacket) of the basis for a declination.)</p> <p>For GRFP the term “Applicants” applies to this question rather than “PIs”.</p> <p>Comments:</p> <p>The reviewers’ comments are provided to the applicants as part of the applicant rating sheets. The applicants are not provided with their overall rating (1-50 scale), and it is not clear why this information is withheld since it might assist and encourage promising applicants to submit a revised application in the future. It might also discourage resubmissions of non-competitive applications without substantial revision.</p> <p>Providing reviewers’ comments ensures that applicants receive all available information that is specific to their application. Its usefulness depends on the quality and depth of the reviewers’ comments (see A.1.3 above for comments on this subject) which would be improved if recommendations above were adopted.</p> <p>Recommendation: The Recommendation Memo provides a great deal of background information that would be helpful to prospective applicants. It is not clear from the materials provided the COV whether or not this information is communicated to the applicants. If not, we recommend that this be done.</p>	
<p>7. Is the time to decision appropriate?</p> <p>Note: Time to Decision --NSF Annual Performance Goal: For 70 percent of proposals, inform applicants about funding decisions within six months of proposal receipt or deadline or target date, whichever is later. The date of Division Director concurrence is used in determining the time to decision. Once the Division Director concurs, applicants may be informed that their proposals have been declined or recommended for funding. The NSF-wide goal of 70 percent recognizes that the time to decision is appropriately greater than six months for some programs or some individual proposals.</p> <p>Comments:</p> <p>The timeline identified in the Key Program Dates document provided by program staff to the members of the COV is appropriate. Depending on area, solicitations are open until beginning of November, providing students with ample time to complete application. Applicants have until December 1st to send in recommendation letters to NSF. Panel evaluations take place in a 10 day + time frame.</p> <p>Comment/Recommendation:</p>	<p>YES</p>

It is important that prospective fellows be notified at least two weeks in advance of the April 15 Council of Graduate Schools approved deadline for students to notify schools whether or not they plan to accept an offer of admission (see <http://www.cgsnet.org/?tabid=201>). The sooner students can receive notification the better because some schools base admission decisions of funding availability. If a student who applied for an NSF GRFP student receives funding through the program, the student's prospective school may be able to reallocate funding from the GRFP-supported student to another student who might not have originally received an offer of support (or admission). Early decisions also give students the opportunity to explore options (in terms of potential advisors or schools).

Recommendation: Is the timeline available on the web to potential applicants? If not, could it be made available? For some at-risk, low-income applicants, the availability of NSF GRFP funding might be a key in a prospective fellow's decision to attend graduate school.

8. Additional comments on the quality and effectiveness of the program's use of merit review process:

It is very good that the program staff provides reviewers with a rubric for scoring. It is also very good that applicants are grouped based on quality. This grouping is appropriate and probably very useful to the program staff when making final decisions.

It is very good that applications are sorted according to level of study prior to review. This encourages comparison of applicants who are similar to one another.

Having access to practice files prior to the start of the review process facilitates reduction of inter-rater variation.

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Recommendation: The website <http://www.nsfgrfp.org/> contains much helpful information. The NSF GRFP website http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=6201 should contain an explicit link or reference to the nsfgrfp.org site. Some students (and/or their mentors) may only search for information about the GRFP on the NSF website and may never find out about the nsfgrfp.org site. Students who visit nsfgrfp.org have a distinct advantage over those who do not visit the site. The interests of the STEM community at large would be best served if all potential applicants were counseled to make use of the information at nsfgrfp.org. The easiest way to do this is through a simple (but prominent) link to nsfgrfp.org from the NSF GRFP website.

Recommendation: The question of whether or not GRE scores should be submitted should be revisited. As it currently stands, GRE scores are optional, but the large majority of students submit them and NSF will even reimburse students for the cost of the sub-

ject area GRE test if the student takes the test primarily so the score can be submitted as part of the NSF GRFP application package. This sends a clear message to students and their mentors that GRE scores are important. It seems likely that only students who scored poorly on the tests will choose not to submit, and reviewers probably are aware of this. Given the fact that there is controversy regarding whether or not the mean of GRE scores for underrepresented minority test takers are many points below those of majority test-takers, it seems that the use of GRE scores may unfairly bias reviewer's decisions toward majority applicants. Low-income students may also find the cost of the general GRE test prohibitive (it currently costs \$150). Low-income prospective applicants and applicants from rural areas may face an additional challenge in getting to an approved GRE test center. Although the NSF GRFP does not charge an application fee, they are essentially levying such a fee on applicants by requiring the GRE. From a reviewer's perspective, inclusion of a GRE score (or not) in an application does not encourage holistic review of an applicant's file. For the reasons described above, we recommend that NSF eliminate GRE scores from the application package.

Recommendation: It is good that reviewers are given the opportunity to rescore files if they wish to do so. One concern with this practice is that "strong" reviewers may end up influencing the decisions of "weak reviewers" so that one perspective may dominate. It would be good if program staff would explicit counsel reviewers to only rescore an application if they missed seeing some part of it on their initial review. Since part of NSF's goal is to take some risk, the NSF GRFP program should be willing to provide support to some applicants who show strong promise, but do not receive the highest overall ranking or the highest scores on either of the two NSB review criteria.

Recommendation: The program solicitation should explicitly state that applicants are allowed to include work or industry research experiences in their personal background statement. This would encourage students who are inclined toward an industry career to participate in the program by submitting applications.

Recommendation: The members of the COV were of different minds regarding the distribution of funding based on proposal pressure. Although this method allows the community to drive the allocation of funds, it reduces the potential for NSF to make foundation-wide strategic decisions. The COV recommends that program staff attempt to build collaborations with the research directorates that could result in funding of additional fellows in strategic areas (as was done with GEO in 2009). As state-funding for higher education continues to decline, the cost of tuition is rising rapidly at public schools. It is becoming increasingly difficult for faculty PIs who are funded to conduct research through a single-investigator award to be able to support a PhD student for the entire 3-5 years required for completion of a degree. The NSF GRFP is the only NSF program that specifically provides for the graduate students who will be the future STEM leaders in academia, industry, and government.

Recommendation: It would be good to require a random sample of awardees to participate in a verbal (perhaps online) interview prior to receiving funding. This would help to eliminate the possibility that some applicants are not writing their own applications.

Recommendation: It would be desirable to understand whether the application really represents the student's skills and competencies (especially those whose primary language is NOT English).

Recommendation: It would also be interesting to bring a selected group of awardees to

NSF to have them share their experiences (good and bad) regarding the process, their experience and the outcomes – have the event broadcasted to all high schools in the country to promote the program nationwide.

A.2 Questions concerning the selection of reviewers. Provide comments in the space below the question. Discuss areas of concern in the space provided.

SELECTION OF REVIEWERS	YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE ²
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments:</p> <p>The Recommendation Memo provided to the NSF GRFP program staff by ASEE clearly describes the basis for recommending panelists. Race, ethnicity, gender, geographic location, type of institution, field of study, specific expertise, and prior service as a panelist are all addressed in the memo. The Recommendation Memo clearly lists broad field and specific area(s) of expertise for each prospective panelist.</p> <p>Recommendation: The documentation provided to the COV does not include information about the disciplinary expertise of the people selected to serve on the panels. This information should be provided to future COVs. Ideally the number of panelists with expertise in a specific area should be directly related to the number of proposals submitted to that area (which is probably what is currently done). It is not clear how panelists are selected to review the “interdisciplinary” applicants. The COV members would appreciate receiving more information about this process.</p> <p>Recommendation: The virtual absence of industry representatives and past fellows among panelists is worrisome. The COV highly recommends that more than a “handful” of industry representatives participate in panel evaluations. Panels should also include past fellows.</p> <p>Recommendation: If possible, program might consider forming panels that include individuals drawn from multiple disciplines to review the interdis-</p>	<p>YES</p>

² If “Not Applicable” please explain why in the “Comments” section.

<p>ciplinary proposals.</p> <p>Recommendation: The COV highly recommends including criteria in the application pertaining to the student’s plan to engage with industry re-search collaborators as well as international collaborations.</p>	
<p>2. Did the program use reviewers balanced with respect to characteristics such as geography, type of institution, and underrepresented groups?</p> <p>Note: Demographic data is self reported, with only about 25% of reviewers reporting this information.</p> <p>Comments:</p> <p>Yes. The documentation provided to the members of the COV (Panelists Statistical Summary) demonstrates that geography, type of institution, and participation of underrepresented groups is being taken into account in the selection of panelists.</p> <p>Program is to be commended for paying close attention to diversity (in all its forms). It is good that the schools that host the majority of the fellows are not overrepresented on the panels.</p> <p>Recommendation: It seems that private schools may be over-represented among the panelists (31%).</p> <p>Recommendation: Community college faculty members do not appear to have been represented among the panelists until 2009 (when there were three). Consider including community college faculty members (who have the PhD in a STEM field) in the future. Inclusion could lead to more broad dissemination about the NSF GRFP to low-income, first-generation, and underrepresented minority students who may have their first college experience at a community college. Dissemination of information of this type may help at-risk students learn that they may have the opportunity to attend graduate school – with full funding – which may help to diversify the graduate application pool nationwide. Serving on a panel would also be an outstanding professional development opportunity for the community college faculty.</p>	<p>YES</p>
<p>3. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments:</p> <p>Yes. The Panel Guide and the NSF GRFP Panel Briefing documents provided to members of the COV demonstrate that panelists are informed about what constitutes a conflict and provides information about the way that conflicts are to be handled if they cannot be avoided.</p> <p>Panelists are also required to sign a COI form.</p>	<p>YES</p>

<p>In the Panelist Comments Report 2009 (contract #DGE-0426243), panelists commented on the fact that while they signed a COI form, there were a few incidents that arose, causing some persons to feel uncomfortable. Some panelists felt that they “did not have the opportunity to voice” their concerns.</p>	
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<p>4. Additional comments on reviewer selection:</p> <p>Recommendation: It appears that the reviewers are self-selected and that potential reviewers are asked to nominate themselves through http://www.nsfgrfp.org/. This is a good process for the program to find the large number of reviewers that they need each year. One recommendation that would help enhance the size of the reviewer pool would be to provide an explicit link to http://www.nsfgrfp.org/ on the NSF GRFP website http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=6201.</p> <p>Recommendation: Reviewers from industry should be sought to provide a more diverse perspective on the applicants’ files.</p> <p>Recommendation: NSF should consider allowing panelists to work from their home site through interactive web-based technology. Some panelists may prefer to not spend time traveling to DC, while others may view the opportunity to visit with colleagues and NSF staff a significant benefit and would be unhappy to give up the opportunity to network. Perhaps NSF could make remote participation optional for some portion of the panel to determine whether or not the option is attractive to reviewers.</p> <p>Recommendation: NSF may consider taking proactive actions intended to assemble a more diverse group of panelists, rather than rely solely on the website. For example, program staff may request that panelists recommend other colleagues to serve on future panels.</p>

A.3 Questions concerning the resulting portfolio of awards under review. Provide comments in the space below the question. Discuss areas of concern in the space provided.

<p style="text-align: center;">RESULTING PORTFOLIO OF AWARDS</p>	<p style="text-align: center;">APPROPRIATE, NOT APPROPRIATE³, OR DATA NOT AVAILABLE</p>
<p>1. Overall quality of the research and/or education projects supported by the program.</p> <p>Comments:</p>	<p style="text-align: center;">APPROPRIATE</p>

³ If “Not Appropriate” please explain why in the “Comments” section.

<p>Fellows report having participated in a variety of activities that are consistent with the program objectives and with good practice in graduate education. They are especially well on their way to preparing for successful careers in research as reflected in the (2007-2009) percentage in reporting publications (42%) and presentations (43%). Several others reported having acquired patents. Less impressive are their contributions to the Broadening Participation goals of the NSF (20%) and it is unclear as to the relative contributions in gender, race, ethnicity, and disability categories. Even smaller levels are reported for integrating education and research, and for teaching.</p> <p>Recommendation: The NSF should prepare samples of expectations for the Broadening Participation aspect of Fellow's work during the period of support in graduate school.</p>	
<p>2. Does the program portfolio promote the integration of research and education?</p> <p>Comments:</p> <p>The application instructions are silent on the importance of integrating research and education and the activity reports reflect only modest work in this area. In view of the fact that many recipients will become future members of the professoriate in colleges and universities, there is an apparent need to establish a reasonable set of standards in this area in both the application and graduate enrollment period. Even those students who choose not to pursue academic careers in the private and government sectors might well find themselves in mentoring roles with interns and new hires in which such integration may well prove useful.</p> <p>Recommendation: The NSF should establish expectations for graduate students to engage in activities to integrate education and research, and possibly teaching, for some portion of their graduate study.</p> <p>By emphasizing Broader Impacts as a criterion for award, and by detailing how education and mentoring are examples of Broader Impacts, the GRFP has focused the attention of applicants on integration of research and education. For example, NSF fellow 2005018653 (from GRF Accomplishments 2007-2008) has been working on germ resistant tomato strains for West Africa. In addition to developing the strains, he has been training a local West African research force to continue the work and eventually cooperate with the West Africa Seed Alliance to distribute the seeds to local farmers.</p> <p>In an effort to further develop this integration we recommend that the GRFP consider extending eligibility to students entering their third year of graduate school. Students at this stage are more likely to understand how their research interacts with education.</p>	<p>APPROPRIATE*</p>

<p>3. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments:</p> <p>The size and duration of the awards are quite appropriate if the nation is to attract the best and the brightest to pursue doctoral study in STEM fields as opposed to premature entry into the world of work. Moreover, the award level is particularly attractive for individuals who come from low income groups or who have graduated from undergraduate school with high debt levels. Finally, the stipend level places desired pressure on universities to raise their stipend levels from internal sources, thereby adding to their attractiveness as destinations for students who might wish to pursue doctoral study.</p> <p>Recommendation: In view of the economy and the rising costs of education (and tuition especially at private institutions), the NSF/Congress should consider increasing the funding level to universities. Allocations are currently too low.</p> <p>The awards are appropriate in size, as befitting their distinguished nature. Also, an award of three years is appropriate for graduate education. After the third year, consider a fellowship extension of up to one year based upon evidence of broader participation.</p>	<p>APPROPRIATE</p>
<p>4. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Innovative/potentially transformative projects? <p>Comments:</p> <p>The portfolio contains a wide variety of projects, many, if not most are innovative or potentially transformative. For example one in political science focused on how the political impact of Hurricane Katrina had on political society in New Orleans and how understanding of the political process and political capital could be useful to the residents to address the disastrous effects of the hurricane. Another, project (2008) focused on research in ecology could be used to enhance women in science, academic success for learning disabled students, and tutoring/mentoring of young people impacted by the hurricane.</p> <p>As the GRFP targets students at the early stages of graduate school, it is difficult to assess the potential for transformative research. Bearing this in mind, the GRFP could consider applicants further along in their careers. Indeed, there is some evidence to indicate that students who are further in their graduate careers are at least as strong as applicants with little experience of graduate education. From the document 2009 Recommendation Memo, we see that 25 percent of applicants from Level 1 (who have not yet enrolled in</p>	<p>APPROPRIATE</p>

<p>graduate school) are placed in either Quality Group 1 or Quality Group 2 (and hence form the pool of potentially funded applicants) while 28 percent of applicants from Level 2 and 27 percent of applicants from Level 3 are placed in these quality groups.</p> <p>We recommend that the GRFP consider broadening eligibility to include students who are starting their third year of graduate study within a field. As these students will be commensurately further along in their research, panelists will have more information regarding the quality of research, in contrast to simply the promise of quality research.</p>	
<p>5. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Inter- and Multi- disciplinary projects? <p>Comments:</p> <p>Yes, the program has clear samples of how important interdisciplinary work is done under its auspices. For example—and there are many more—one student is studying many dimensions of cognitive science in which he is combining work in neuropsychology, cognitive psychology, neural imaging, linguistics and communication disorders to understand how neural mechanisms work for brain, language, and thought. The work is highly innovative and at the cutting edge of science.</p> <p>Recommendations:</p> <p>Because the future of science will be greatly housed and addressed through interdisciplinary arrangements that will cut across the natural sciences, the social sciences and even the humanities, the NSF should consider establishing standards and expectations for all recipients to have an interdisciplinary experience, preferably including the SBE fields, during their matriculation as graduate students.</p> <p>The NSF/Congress should consider changing its budgetary allocations model in such a way as to give a greater allocation to interdisciplinary projects than would be the case from a simple distribution based on the number of applications within the area.</p> <p>The NSF should consider giving extra/bonus points to ALL applications within disciplines that have an interdisciplinary component.</p> <p>With data provided by Gisele Muller-Parker, the success rates of the interdisciplinary applicants exceed those of other applicants (by between ½ and 2 percent).</p>	<p>APPROPRIATE</p>

<p>6. Does the program portfolio have an appropriate balance considering, for example, award size, single and multiple investigator awards, or other characteristics as appropriate for the program?</p> <p>Comments:</p> <p>The duration and award amount for each fellowship are the same. Portfolio balance is achieved through demographic considerations.</p> <p>The GRFP is unusual in that all of the awardees receive an award of equal size.</p>	<p>YES</p>
<p>7. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Awards to new investigators? <p>NOTE: A new investigator is an investigator who has not been a PI on a previously funded NSF grant.</p> <p>Comments:</p> <p>The program funds only fellowships to graduate students and undergraduate seniors contemplating enrollment in graduate school the following year.</p> <p>The GRFP is unusual in that all of the awardees are at the early stages of their graduate careers and so are generally new investigators.</p>	<p>DATA NOT AVAILABLE</p>
<p>8. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Geographical distribution of Principal Investigators? <p>Comments:</p> <p>The program funds only graduate students (not PIs). Geographical distribution of awardees is tracked by state of high school graduation. It appears that CA has a disproportionately large number of applications and awardees relative to its population. Southern states, especially poorer ones, e.g., MS and AR, seem to have lower numbers than their population would suggest. All of these numbers need to be compared, however, with relative state size (by percent of the total). Perhaps, predictably, the correlation between state income (and maybe racial distribution) is perhaps contributing to this apparent phenomenon.</p> <p>Recommendation:</p>	

<p>The NSF should consider the development of a strategy for soliciting (and providing technical assistance) applications in states with low incomes and relative high percentages of underrepresented racial/ethnic minorities. For example use the EPSCR network for increasing GRFP outreach and applications.</p> <p>Geographical distribution is a principal focus of the algorithm employed to select awardees from Quality Group 2. As can be seen from the document Applicants, Awardees and Honorable Mentions by State of High School, the fraction of applicants who receive an award or honorable mention is comparable across each state.</p> <p>Geographical distribution is a principal focus of the algorithm employed to select awardees from Quality Group 2. As can be seen from the document Applicants, Awardees and Honorable Mentions by State of High School, the fraction of applicants who receive an award or honorable mention is comparable across each state.</p>	
<p>9. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Institutional types? <p>Comments:</p> <p>Applications come from a variety of institutions across the United States. Data on institution type by Carnegie Classification were not provided. The number of applications and awards from HBCUs is disappointingly low. HBCUs, for example, which graduate almost 25% of all African American four-year college graduates—only produced 101 applications and 6 awards. Yet, 12 of the top 20 baccalaureate origins of African Americans who later get PhD degrees in S and E are HBCUs. Similar disappointing numbers were presented for HSIs—122 applications and 6 awards. It is important to be reminded, however, that an institution classified as an HSI only requires a Hispanic population of 25% Hispanics. In other words, it is unknown as to what % of the HSI applications are in fact Hispanics.</p> <p>Recommendation: The NSF needs to develop an aggressive campaign to solicit (and provide technical assistance on Fellowship application preparation at minority serving institutions.</p> <p>The NSF staff should prepare a data-based report on applications and awards by Carnegie classification type.</p> <p>The GRFP awards fellowships to students from a wide range of undergraduate institutions, although the vast majority is from institutions with a prominent graduate emphasis. For example, for fellowships awarded in 2008, nearly 70 percent of GRF applicants (5609 out of 8146 applicants) received</p>	<p>APPROPRIATE</p>

<p>their undergraduate degree from a university with a substantial focus on graduate education (data provided by Gisele Mueller-Parker).</p> <p>In an effort to continue to attract students from a broader range of institutions, we recommend that GRFP officials enhance recruiting efforts in two areas. First, many disciplines have programs designed to prepare students from disadvantaged minorities for graduate training (for example, the Summer Training Program in Economics, sponsored by the American Economic Association). Some of these programs are also funded by the NSF (often through the Research Experiences for Undergraduates program) but an exhaustive search across disciplines should be undertaken. Second, the GRFP should target government and industry sources of potential graduate students. For example, within Economics, the Board of Governors of the Federal Reserve is the largest employer of research assistants, and this pool of more than 75 potential graduate students would be an excellent source of GRFP applicants.</p>	
<p>10. Does the program portfolio have an appropriate balance:</p> <ul style="list-style-type: none"> • Across disciplines and sub disciplines of the activity? <p>Comments:</p> <p>The program balance is determined by the number of applications per discipline/sub discipline relative to the total number of applications. This model does not allow for an “oversampling” of disciplines annually in accordance with the national need or designated priority areas. This approach may not best serve the nation.</p> <p>Recommendation:</p> <p>The NSF/Congress should consider a modification of the current model for determining the “quota” for disciplinary representation by reserving or setting aside a certain percentage of the annual pool of slots for distribution to specified areas of national need or designated priority.</p> <p>As noted in the document 2009 SE11, which tabulates Success Rates by Gross Field, all of the major disciplines are well represented in awardees.</p> <p>One question that arises concerns the presence of Public Policy as a field of NSF support. We recommend that the NSF review the presence of Public Policy to ensure that it is a field that is worthy of NSF support. Further, we recommend that the NSF consider closer coordination between the GRFP and the research directorates to ensure that areas of emphasis receive appropriate support.</p>	<p>APPROPRIATE</p>

<p>11. Does the program portfolio have appropriate participation of underrepresented groups?</p> <p>Comments:</p> <p>There is an impressive increase of applications and awards for underrepresented minority groups, especially for African American, since 2006. Although not as impressive, increases are noted for Hispanics. Data from other underrepresented racial/ethnic groups were not noted, nor for persons with disabilities. It would be extremely important to acquire data on the status of underrepresented women of color in relationship to women in general and in relationship to men within their racial/ethnic group.</p> <p>Recommendation:</p> <p>The COV highly recommends that NSF provide comparative data on minority representation on applications and awards in relationship to the old Minority Graduate Research Fellowship program.</p> <p>The NSF should provide data on the representation of women of color for applications and awards in relation to women in general and to men within their racial/ethnic group.</p> <p>The NSF should provide statistical data on the application/awards rates for native Americans and other underrepresented groups and for persons with disabilities.</p>	<p>APPROPRIATE</p>
<p>12. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports.</p> <p>Comments:</p> <p>The program is clearly relevant to national priorities and needs with respect to the development of a STEM workforce with advanced education and representing an increased representation of American citizens. The program falls a bit short in making awards to women (the majority of US citizens and permanent residents in colleges and universities) and African Americans and Hispanics (the fastest growing groups). This need is cited in <i>The Gathering Storm</i> and captured in such recent congressional actions as <i>The America Competes Act</i>.</p>	<p>APPROPRIATE</p>

<p>13. Additional comments on the quality of the projects or the balance of the portfolio:</p>	

A.4 Management of the program under review. Please comment on:

<p>1. Management of the program.</p> <p>Comments:</p> <p>GRFP has a management plan which establishes the program’s goal and context, the program organization and staffing, description of the Operations Center (run by ASEE) with information pertaining to the program management (including new solicitation, GRFP process and cycle, eligibility review guidelines, panel guidelines, post award management, program evaluation and impact, budget requirements and program schedule and who is responsible for each of these activities). It also describes additional program investments (like the Women in CISE fellows). Program Guidelines appear to be revised periodically (for example the revised Guide for Fellows & GRFP Coordinating Officials NSF 09-62 (Replaces NSF 97-26 & NSF 04-054) done in August, 2009).</p> <p>The program has been in existence since 1952 and overall is well managed. With a long-standing program there is the possibility that it may become stagnant. Thus, care should be taken to ensure the program is open to change, particularly in addressing changes in research needs or adapting new web-based tools for its management. For example enhanced use of the web to review applications by panelists, enhance dissemination of the GRFP through the web particularly to channels used by the underrepresented minorities.</p> <p>The Graduate Research Fellowship Operations Center is responsible for running the interface with applicants, processing applications, conducting outreach activities and responding to questions about the program.</p> <p>RECOMMENDATION:</p> <p>GRFP investments require strategic alignment with NSF overall portfolio investments. That is, the human resources development – especially in new areas of technology – needs to be consonant</p>

with NSF goals.

2. Responsiveness of the program to emerging research and education opportunities.

Comments:

In order to respond to new areas/challenges of research, the category of “interdisciplinary research” has been added to the traditional S&T areas for students to select. The meaning of interdisciplinary has also been described in the solicitation to ensure that students understand the concept. For the 2009 competition, of the 9,347 applications received, 1,691 were listed as interdisciplinary and an ad-hoc process of tracking several thematic areas was incorporated during the panel review. Specifically, applications that involved research on energy, climate change, or national security as well as research that included international activities and/or cyber infrastructure resources were flagged by panelists for special consideration. The percentage of awardees with interdisciplinary applications was slightly higher than the proportion in the overall submitted applicant pool: 19.7% in 2007, 19.5 % in 2008 and 18.5% in 2009. In addition, individual directorates support additional awards in areas of interest (for example, CISE and Engineering providing funding additional awards for women).

Yet, GRFP appears to rely on past history of applicants to plan investments in the various disciplines with little or minimal strategic planning aligned with NSF overall investments.

Since the distribution of fellowships in the different fields is based on a fixed percentage of the applications, the program responsiveness to emerging research depends on the trends set p by the applicants and consequently is indirect. NSF may consider influencing this outcome by varying the percentage based on established national research and education needs.

RECOMMENDATIONS:

GRFP Officials should proactively and strategically plan the investment portfolio for alignment with NSF research priority areas.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments:

As mentioned in A3, GRFP has a management plan to guide program implementation. In addition, GRFP as part of EHR participates in NSF’s strategic planning processes. Yet other than the budget requirements for a specific year, the management guide does not include a phase/step where dialogue/discussion (internal to GRF, EHR, other NSF directorates, US industry research investments as well as benchmarking other countries/jurisdictions investments) around the possible distribution of funds will be that fiscal year.

RECOMMENDATIONS:

It is highly desirable for program officials to proactively align program investments with NSF strategic directions as well as industry research investments, and to benchmark with other countries, investments to enhance US competitiveness in S&T.

The program planning and prioritization process appears somewhat passive, perhaps due to the long tenure of the program. This process seems particularly relevant regarding the response of the program to emerging technologies or national research needs.

4. Responsiveness of program to previous COV comments and recommendations.

Comments:

The vast majority of recommendations and comments from the previous COV comments (2006) have been effectively addressed by the Program. Nevertheless the recommendation that “**NSF needs to begin an immediate and detailed review <of> the current funding model and implementation changes to ensure the NSF Graduate Research Fellowships support research and education among more of the most capable science and engineering graduate students in the United States**” focused on a couple of elements only: 1) The development of a position paper in 2007 framing the issue by describing the problem, summarizing the previous research and trends, presenting the recent changes adopted by other federal agencies and the rationale for those changes, and proposing a strategy to initiate internal discussion about this issue (the position paper mentioned was supposed to be sent to the division directory by Spring of 2007 could not be found by program staff. A 2004 Workshop Report on the emerging issues, research and current practices related to financial support for the graduate students and postdoctoral researchers - sponsored by NSF, NIH and the CGS - was provided to the COV); and 2) a current cost comparison study of fellowship programs and improving the internal accounting by ensuring compliance on expense reporting (FastLane reporting system).

RECOMMENDATIONS:

It is highly recommended that a comprehensive ‘business model’ be developed wherein all possible sources of funding for graduate fellows (internal as well as external to NSF) be considered (for example, partnerships with industry, other federal agencies as well as other countries). Now that the GRFP budget is likely to triple in the next few years, this business model could be especially important as resources could be considerably increased by these partnerships. In addition, awardees could have a greater opportunity to engage in more interdisciplinary, multi-stakeholder, multinational research experiences that would be of great benefit to them.

The program has responded well to previous COV comments and recommendations. The only concern is if a COV every three years is sufficient to keep the planning and prioritization of the program updated.

5. Additional comments on program management:

The GRFP seems to be an effectively and efficiently well run program with excellent outcomes for the US. The program officers seem to have very good control of the execution of the program and

assessing its outcomes.

RECOMMENDATION:

The program could benefit from strong strategic planning, aligning its investment to the overall NSF portfolio investments and priorities. It would also benefit from proactively planning to increase investment opportunities (internal and external) especially in new and priority areas of research, such as energy, climate change, cloud computing and new economic models.

PART B. RESULTS OF NSF INVESTMENTS

The NSF mission is to:

- promote the progress of science;
- advance national health, prosperity, and welfare; and
- secure the national defense.

To fulfill this mission, NSF has identified four strategic outcome goals: Discovery, Learning, Research Infrastructure, and Stewardship. The COV should look carefully at and comment on (1) noteworthy achievements based on NSF awards; (2) ways in which funded projects have collectively affected progress toward NSF’s mission and strategic outcome goals; and (3) expectations for future performance based on the current set of awards.

NSF investments produce results that appear over time. Consequently, the COV review may include consideration of significant impacts and advances that have developed since the previous COV review and are demonstrably linked to NSF investments, regardless of when the investments were made.

To assist the COV, NSF staff will provide award “highlights” as well as information about the program and its award portfolio as it relates to the three outcome goals of Discovery, Learning, and Research Infrastructure. The COV is not asked to review accomplishments under Stewardship, as that goal is represented by several annual performance goals and measures that are monitored by internal working groups that report to NSF senior management.

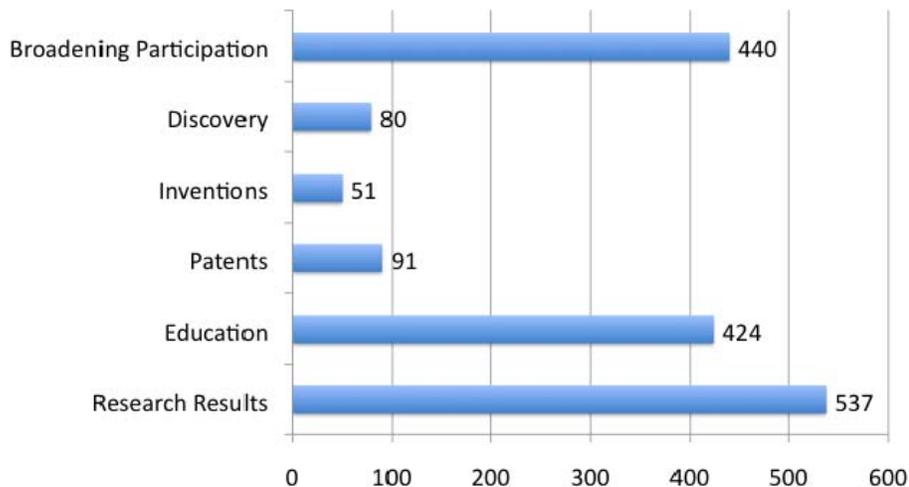
B. Please provide comments on the activity as it relates to NSF’s Strategic Outcome Goals. Provide examples of outcomes (“highlights”) as appropriate. Examples should reference the NSF award number, the Principal Investigator(s) names, and their institutions.

B.1 OUTCOME GOAL for Discovery: “Foster research that will advance the frontier of knowledge, emphasizing areas of greatest opportunity and potential benefit and establishing the nation as a global leader in fundamental and transformational science and engineering.”

Comments:

The NSF Graduate Research Fellowships are prestigious awards for new graduate students, and can be an indicator of early success, often making it easier for a student to be accepted in a graduate program or a laboratory group. NSF states that, “The GRFP is responsive to the nation’s need for a strong, diverse, and globally engaged science and engineering workforce and supplies the following summary graph:

Average Number of Graduate Fellows Reporting by Category in Fys 2007-08 and 2008-09



We were given numerous examples of outstanding fellowship recipients whose dissertation research has led to patents, potentially transformative research, and important new technology. For example: a doctoral candidate in **Electrical Engineering at Princeton University** who is researching ways to improve the performance and expand the capabilities of quantumcascade (QC) laser technology. In 2008 this student was awarded Princeton University's Wu Prize for Excellence and the Wallace Fellowship award (signifying one of 20 top Ph.D. students), as well as a Sigma Xi award; a Ph.D. candidate in **Materials Engineering at Northwestern University** who is researching structure-property relations in acrylic triblock copolymer gels for the processing of metals and ceramics. Early on, she focused on the rheology of the gels and its correlation to their structure. By understanding the effect of relative block length on the structure and flow behavior of the gel, Michelle and her collaborators were able to optimize the triblock for ceramics processing; a doctoral student in the Department of **Statistics at Oxford University** who is currently developing statistical methods that use known haplotypes to quickly and accurately infer haplotype phase and missing genotypes in large population genetic samples, and this student has developed a new statistical technique which uses existing data (or "genotypes") to make educated guesses about data that have not actually been observed (called "imputation" by statisticians). These results were hailed as one of the major scientific achievements of the year both within and beyond the field of genetics. Moreover, their research paper on the subject published in the journal, *Nature*, won a number of year-end awards from scientific publications (e.g., *Nature*, *Science*, and *Scientific American*). Another fellow studying the mineralogy of Mars, using high-resolution images from the Compact Reconnaissance Imaging Spectrometer for Mars on board NASA's Mars Reconnaissance Orbiter has discovered evidence of carbonates showing that liquid water was not uncommon on the red planet and, moreover, that it created diverse sets of habitats.

These anecdotal examples, and many others are inspiring and illustrative, but they are not as useful in overall program evaluation as a broader analysis would be. No doubt an equal number of such

examples could be found among graduate students who did not receive an NSF Graduate Fellowship award. What is needed is a longitudinal study in which fellowship recipients are followed for a significant portion of their professional lives and compared with a cohort of individuals who did not receive fellowships but who were otherwise generally equivalent. Indeed, ideally there would be at least two comparator groups: individuals who did not apply for fellowships and those that applied but did not receive awards. One would be interested in a number of quality indicators such as employment history, scientific productivity, citation index, number of patents, number of students and supervised postdocs, history of grant support, major awards, etc. In this analysis it would also be possible and instructive to examine the predictive value of the GRE, the relative impact of fellowship recipients on industry as well as academia, particularly in terms of workforce development, and the impact of fellowship recipients vs. non-recipients on direction of their fields and the applicant stream and success rate of students under their supervision.

Longitudinal studies are challenging to do, particularly in retrospect, but they should be part of an ongoing assessment plan of a program of this duration and scope. NSF may have missed the opportunity to create and implement such a plan 40 years ago, but, if such a plan were implemented now, it would be useful in the short term to assess the impact of NSF Graduate Research Fellowships on success of recipients in graduate school and more importantly, long term to assess impact on science and technology over the next 20 years.

Our NSF materials state that, "There are currently 3,324 fellows enrolled in nearly 200 institutions in the United States and abroad. Approximately 30% are in engineering, 30% in the life sciences, 20% in the physical sciences (including mathematics), and 20% are in the social sciences. Fellows may enroll in any accredited institution in the United States or abroad and, thereby, access the best scientific expertise and resources in the world." Data on where students choose to take their awards provides some insight into likely impact of these awards. For example, an analysis of 2009 awards data indicates that a small subset of universities dominated the choices of winning applicants. The overall funding rate for the 2009 application pool was 14% (661 of the 9015), but 23 of the total of 409 schools had a success rate of greater than 15% among the students who chose the school as their preferred destination. In fact 53% of the awardees chose one of these schools as their graduate school destination. The biggest "winners" in this student popularity contest were:

- UC, Berkeley (124)
- MIT (110)
- Harvard (75)
- Stanford (72)
- University of Washington (45)
- Cornell (34)
- UCSF (29)
- Princeton (28)
- Carnegie-Mellon (28).

The corresponding success rate of applications from students heading for these big winners was

- 26% for MIT
- 25% Carnegie-Mellon
- 19% for Cornell,
- 23% for Harvard,
- 23% for UCSF
- 20% for UC, Berkeley,
- 19% for Princeton,
- 18% for UW

- 15% for Stanford

This is not really a direct measurement of research impact of the GRF program, but it is an indicator that a high proportion of students receiving awards are heading for some of our most productive and high-powered research universities in large numbers.

Baccalaureate students from these campuses also do very well in terms of their proposal submissions, but except for Harvard, MIT, Stanford and Berkeley the major research universities do not dominate the success chart in production of successful applicants to the same degree they do in receiving fellowship awardees.

GRFP funds graduate students in the various science, math and engineering disciplines, therefore helping develop and prepare the human resources that the nation will need to maintain and enhance US leadership in science and technology. However, it appears that fellows spend most (if not all) of their time at an academic institution and there's hardly any evidence provided to the COV that shows fellows engaging with the other sectors conducting important research (e.g., national labs, industry, etc.).

RECOMMENDATION:

In order to maximize outcomes and help achieve NSF goal for discovery, encourage awardees to interact and spend time conducting research in organizations other than their PhD program institution.

B.2 OUTCOME GOAL for Learning: “Cultivate a world-class, broadly inclusive science and engineering workforce, and expand the scientific literacy of all citizens.”

Comments:

While the GRFP has made a number of changes to help develop a broadly inclusive technical workforce, the fraction of applicants who are female and who are members of underrepresented minorities has remained relatively constant over the past three years. According to the 2009 Recommendation Memo, females accounted for 45 percent of applicants while underrepresented minorities accounted for 12 percent of applicants. In an effort to increase the number of underrepresented minority applicants, the GRFP could target discipline specific programs designed to prepare students from these backgrounds for graduate school. One such program, which has recently received a site visit, is the Summer Training Program in Economics, sponsored by the American Economic Association. The program, which has recently received NSF funding, has been in existence since 1974 and is the largest pipeline of such students for graduate school. For example, in 2009 the program graduated 25 students, 20 of which are expected to apply for the NSF GRFP over the next three years.

We recommend that the GRFP identify all such discipline specific programs and visit them annually. Moreover, the site visits, which are currently designed principally to tell the students about the existence of the program, should be more focused on tips for applying, perhaps covering the information that is currently condensed from the previous experience of fellows.

In awarding fellowships, however, the GRFP has done much to help broaden inclusion. As the 2009 Recommendation Memo outlines, 55 percent of recent awardees are female and 15 percent of awardees are underrepresented minorities. Given the pool of applicants, the fellowship winners are reflective of society at large and, by extending the reach of technical success to more corners of the population, help advance understanding and prosperity for the nation as a whole.

In awarding fellowships, however, the GRFP has done much to help broaden inclusion. As the 2009 Recommendation Memo outlines, 55 percent of recent awardees are female and 15 percent of awardees are underrepresented minorities. Given the pool of applicants, the fellowship winners are reflective of society at large and, by extending the reach of technical success to more corners of the population, help advance understanding and prosperity for the nation as a whole.

The GRFP has a long tradition of funding students who go on to highly visible research careers and form the backbone of a world-class technical workforce. As evidence for this, one can see the prominence of the graduate programs that enroll the fellows: 30 percent of all fellows are graduate students at Berkeley, Stanford or MIT (data provided by Gisele Muller-Parker). If one adds Caltech, Harvard, Princeton and Yale, the fraction of fellows enrolled rises to more than 40 percent. With such prominent placement at graduate programs, there is every reason to believe that the fellows will go on to strong future careers.

Further evidence of noteworthy achievements can be found in the discoveries of individual fellows. For example, NSF Highlight 2009 18593 details how one fellow has developed a technique to more accurately position particles on a nanoscale. As nanoscale technology holds promise for advances on many fronts, such research not only advances science but has the opportunity to also enhance national welfare. Noteworthy achievements need not be technology based, as NSF Highlight 2009 18603 demonstrates. This NSF fellow conducts research within ice caves to determine patterns of glacial melt and his important field research is refining models of melt patterns to aid in understanding of the impact of global warming on ocean levels.

That said much of this discussion regarding development of a world-class workforce is anecdotal in nature. We strongly support the current effort to measure outcomes of research fellows in a more scientific manner.

We recommend that the study, in drawing conclusions regarding outcomes both in graduate school and in work years beyond graduate school (such as number of patents, formation of new businesses or prominence of academic placement) use honorable mention awardees as a potential control group for the study. Perhaps and even better treatment and control would be to focus only on students in Quality Group II and compare those awarded fellowships with those given honorable mention.

To the goal of increasing scientific literacy, individual fellows have made substantial impacts. For example, NSF fellow 2006037002 (from GRF Accomplishments 2007-08) has made significant gains in scientific literacy in her community. A doctoral student in astronomy, this fellow has engaged students in an after-school program targeting African-American and Hispanic students. She has gone on to train undergraduates from Hispanic and Hmong backgrounds (both groups are well represented in her community) to give astronomy programs in Spanish and Hmong in an effort to include parents as well as children in her outreach efforts. Such an all-encompassing effort is likely to change the level of knowledge and interest in science in her local community. This NSF fellow is just one of many with a distinguished record of engagement, which is likely to enhance expectations of future performance (as some of the families reached may have the outcomes of their children positively impacted).

As the GRFP has evolved, clearer guidance for applicants on broader impacts has likely enhanced their development of outreach programs. It may be possible to further strengthen these incentives by altering the funding model slightly.

We recommend that the GRFP consider another year of funding, based on the fellows outreach and education accomplishments and plans. In determining the best way to fund such fellows, it may be that the GRFP turns to other forms of evaluation than the current annual panel. Perhaps the IGERT boards, which themselves award NSF funds to graduate students, could serve as an alternative platform for evaluating students as they may be more closely aligned with the mission of innovative education.

This goal is less appropriate for the GRF program than for some others., and the one way this might be expressed is to engage the NSF fellows in broad educational experiences that result in support of STEM education in the community or that explicitly trains them for teaching or outreach activity later. If this is really a goal of the GRFP, it does not appear to be a high priority from the application guidelines or the outcome documents. This is not surprising. The NSF fellows are students themselves and the whole program is aimed at expanding the number and diversity of individuals being prepared for productive careers in math, science and engineering. On the other hand, there are ways to use the GRFP to do more in this area. For example: Involving more industry representatives as panel reviewers could insert an industry perspective.

Making outreach and training in education more explicit goals in the application and review process would focus attention and investment on these areas. Universities could be asked to provide NSF Fellows with opportunities or explicit training in outreach and education. Most of the faculty members at research universities in this country had little or no training in teaching, particularly with methods involving discovery and project-based instruction rather than teaching in a lecture format. This pattern could be broken if NSF made training in learning and teaching a part of the fellowship program. NSF could also use

B.3 OUTCOME GOAL for Research Infrastructure: “*Build the nation’s research capability through critical investments in advanced instrumentation, facilities, cyber infrastructure and experimental tools.*”

Comments:

The GRFP does not provide funding for research infrastructure, except for cyber infrastructure support, and consequently the outcome of this goal is limited. It does not seem that funding research infrastructure should be a goal of this program, already NSF and other federal agencies support the development of research infrastructure. Perhaps GRFP could interact with other NSF programs aimed to enhance the research infrastructure, such as the NSF Instrumentation program, MRI. For example research in areas aimed to the development of experimental tools could be given more consideration in the review of GRF applications. Also in the review of proposals for the NSF instrumentation program, research participation by graduate students with NSF GRF could be considered. Alternatively support could be given to students interested in interacting with those industries developing advanced instrumentation, computers and experimental tools.

Recommendation: Increase the number of research facilities.

PART C. OTHER TOPICS

C.1. Please comment on any program areas in need of improvement or gaps (if any) within program areas.

GRFP should seek for more participation in the review panels from industry and national research laboratories.

GRFP should seek to involve former fellows (prior recipients of the GRFP) as members of review panels.

GRFP could make the review process more efficient by dividing it into two phases. During the first phase, reviewers rank the proposals and use web-based technology to share their initial rankings. At that point, proposals that are not competitive (ranking group four) are eliminated from further review and discussion. When panel members meet face to face, they will then be able to spend more time considering competitive applicants and providing constructive feedback to those that will not be recommended for funding.

We recommend that the GRFP disallow the reporting of GRE scores.

The program is currently open to applicants who are pursuing master's or PhD degrees but have not yet had much prior graduate experience. We recommend that the program be modified to focus on funding students for the PhD but allow students who already have a master's degree to apply.

GRFP should consider holding back some proportion of the total funding available for each competition to allocate toward strategic areas that align with areas of national need. This will help NSF contribute to the growth of future researchers and leaders in emerging research areas.

GRFP should tap on the pool of students from the undergraduate summer programs funded either by NSF, universities, foundations or industry, to introduce undergraduate students to the opportunity available to them through the NSF GRFP. These programs are often targeted to UM and are therefore an excellent pool of potential graduate students.

Annual reporting templates should require fellows to explicitly report achievements relative to all of the programs goals (e.g., integrate research and education, broader impacts, intellectual merit, interdisciplinary experience, industry experience, international experience, etc.).

Consider awarding \$5k to applicants that receive honorable mention to broaden their education and research experiences.

The cost of education allowance to universities should be increased. Tuition costs nationwide have increased dramatically since the current cost of education allowance level was set. The cost of education allowance is now so low that it may be difficult for some universities to host students.

Award up to \$5k supplements to students who are willing to pursue an opportunity that is outside of the traditional academic training. For example, students who wish to participate in public outreach, formal K-12 education, informal education, international experience, etc.

Increase funding allocated to students from EPSCOR states. Consider pursuing EPSCOR co-funding opportunities within NSF. Increase outreach to the EPSCOR states through the use of former fellows as disseminators of information.

Provide a specific link to the nsfgrfp.org site from the NSF-hosted GRFP website to facilitate sharing of important information with potential applicants and panelists.

C.2. Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.

GRFP should consider conducting a pilot program with industry who will host fellows on their sites. This program could be modeled after the Nordic program. Some industries may be willing to host fellows, and some industries may be willing to host fellows and provide some funding for the fellows while they are at the industry site.

GRFP should contract to conduct a longitudinal outcomes study to determine the long-term impact of the program. The COV anticipates that data collected will be useful to many people within and outside of the foundation. It will be particularly useful for policy decisions. The honorable mentions group forms a natural control group for the study (to use for comparison with the fellows). Some of the outcomes that should be tracked include completion rates, placement of the recipients after the PhD, achievements (Nobel laureates, companies started, patents, etc.).

C.3. Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.

There appears to be a need for interaction between the GRFP and other NSF programs. Most research proposals include budgets to support graduate students, but their selection is left to the proposal's PIs. Given the experience and success of the GRFP in selecting top graduate students and supporting UM, it may be worth looking into the possibility of the GRFP making available the list of students to PIs funded by NSF programs (including the honorable mentions).

Make it clear that panelists know that program staff are available for confidential discussions and responsible for resolving any and all issues that may arise during a panel meeting. This includes conflicts between panel members.

C.4. Please provide comments on any other issues the COV feels are relevant.

As GRFP funding increases, program staff should be proactive in strategically planning portfolio investments to promote development of the workforce needed for the future.

Currently the justification for funding the GRFP is based on the concept that supporting top graduate students meets the NSF mission. The longitudinal study (mentioned in C.2) will help to generate data that can be used to justify continued funding (and/or increased funding) for the program in the future.

One recommendation for the future is to use the characteristics of the undergraduate population as a whole (including students enrolled in community colleges) as a guide to the composition of panels. This will help to ensure that decisions are made that may eventually lead to the demographic characteristics of academia, industry, and government to be more like the population at large.

C.5. NSF would appreciate your comments on how to improve the COV review process, format and report template.

The COV wishes to commend NSF program staff on preparing the documentation for the COV process. The COV members were provided with a Table of Contents and an annotated COV template which both included links to important resource materials. This made it very easy for the COV members to find documents and greatly helped the COV in performing its duties.

The COV also commends the GRFP in overall excellence in the operation of the program. The COV noted that NSF has paid close attention to diversity (in all forms) in the selection of reviewers and fellows.

SIGNATURE BLOCK:

Graduate Research Fellowship Program
Mary Ann Rankin
Chair