CORE QUESTIONS and REPORT TEMPLATE
for
FY 2018 NSF COMMITTEE OF VISITOR (COV) REVIEWS

Guidance to the COV: The COV report should provide a balanced assessment of NSF's performance in the integrity and efficiency of the ***processes*** related to proposal review. Discussions leading to answers of the Core Questions will require study of confidential material such as declined proposals and reviewer comments. ***COV reports should not contain confidential material or specific information about declined proposals.*** The reports generated by COVs are made available to the public.

We encourage COV members to provide comments to NSF on how to improve in all areas, as well as suggestions for the COV process, format, and questions. For past COV reports, please see http://www.nsf.gov/od/oia/activities/cov/.

FY 2018 COMMITTEE OF VISITORS (COV) REPORT
Office of Emerging Frontiers & Multidisciplinary Activities

Date of COV: June 13th/14th, 2018

Program/Cluster/Section: Emerging Frontiers in Research and Innovation (EFRI)

Division: Office of Emerging Frontiers & Multidisciplinary Activities (EFMA)

Directorate: Engineering (ENG)

Number of actions reviewed: 123

EFRI Pre-proposals:
- Invited: 33
- Not invited: 30

EFRI Full proposals:
- Awards: 12
- Declinations: 15

EFRI Supplements:
- Awards: 10
- Declinations: 10

GERMINATION EAGERs:
- Awards: 4
- Declinations: 5

Returned w/o review: 4

Total number of actions within EFMA Office during period under review: 693

EFRI Pre-proposals:
- Invited: 169
- Not invited: 260

EFRI Full proposals:
- Awards: 48
- Declinations: 118

EFRI Supplements:
- Awards: 50
- Declinations: 13

GERMINATION EAGERs:
- Awards: 12
- Declinations: 19

Returned w/o review: 4

Manner in which reviewed actions were selected:

A random sample was performed on EFMA/EFRI new proposal actions for FY2014 through 2017, which included:

- EFRI pre-proposals
- EFRI full proposals
- EFRI supplements
- EFRI proposals returned w/o review
- GERMINATION EAGERs

The resulting population comprised a total of 693 proposal actions as detailed above.

Proposal Actions not included in the sampled population set:

- *Initiatives not led by EFMA/EFRI or not subject to EFMA/EFRI merit review process*

The sampling plan entailed randomly selecting a specified percentage of each proposal type (e.g., preliminary proposal, full proposal) submitted in response to each solicitation, proportionately from each Topic, or submitted in response to other calls for proposals (i.e., EFRI/REM Supplement DCL, EFRI/ODISSEI Supplement DCL, GERMINATION EAGER DCL).

Proposals (Preliminary & Full) submitted in response to the EFRI Solicitation:

- 20% of Invites/Awards were selected for review
- 10% of Do Not Invites/Declines were selected for review
- Where n < 2 for a given category (e.g., a single Topic in a single year), two proposals were selected for review
- All Returned w/o Review proposals were selected for review.

Proposals submitted to EFMA/EFRI other than to the EFRI solicitation (i.e., Supplements, GERMINATION EAGERs):

- 20% of awards were selected for review
- 20% of declines were selected for review (because n=small for this group)
- Where n < 2 for a given category, two proposals were selected for review (except where totaln for that category was <2).

Random selections were performed using the following procedure. The RAND function in Excel was used to assign each proposal a random number between 0 and 1, which iteratively changed upon reloading the file or sorting any column. Columns were first sorted to groups by call type and proposal type, and were then sorted by assigned number within each group, and the first *n* proposals were selected, where *n* equals the number of proposals required for that subsample category. All selections were made based solely on FY, proposal type or proposal status (AWD, DECL, RWR, etc.), and call type, and were performed blind with respect to PI/co-PI ID, institution, title, and all other identifying information.

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COV Membership

	Name	Affiliation
COV Chair or Co-Chairs:	**Leah H. Jamieson *** **Gilda A. Barabino ***	**Purdue University** **City College of New York**
COV Members:	**Dawn R. Applegate** **William Herman** **Craig A. Hoffman** **Rajinder P. Khosla** **Melur K. Ramasubramanian** **Vittal Rao** **William C. Regli** **Sara Wadia-Fascetti** ** NSF/ENG Advisory Committee member*	**RegeneMed Inc.** **FDA, retired** **Naval Research Laboratory** **North Carolina State University** **University of Virginia** **Texas Tech University** **University of Maryland** **Northeastern University**

INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

Briefly discuss and provide comments on *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

I. Questions about the quality and effectiveness of the program's use of merit review process.

Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? Comments: The review methods are appropriate to achieve the goals of EFMA/EFRI. The pre-proposal and proposal jackets reviewed by the COV showed a comprehensive and effective merit review process. The process used to select topics is inclusive, transparent, rigorous, and is designed to avoid exclusion of high-risk ideas for topic selection. The two-step process of pre-proposals followed by full proposals has been effective in yielding research programs that have high impact. EFMA/EFRI has an excellent track record of reviewing proposals in a shorter timeframe than the ENG Directorate as a whole and NSF in general. This rapid review supports EFMA/EFRI's emerging innovation mission and is a strength of EMFA/EFRI. However, given the number of full proposals that received mediocre evaluations and recommendations, EMFA/EFRI may want to consider increasing the rigor of the pre-proposal review. Requesting fewer full proposals would reduce the workload on both the review process and on researchers whose pre-proposals makes it highly unlikely that their full proposals will be competitive. This would support the sustainment of EFMA/EFRI's record of very rapid review. A more selective review of pre-proposals should include more detailed feedback to the PIs who have brought forward truly transformative ideas that need more development before being appropriate for a full proposal.	**YES**

2. Are both merit review criteria addressed a) In individual reviews? The individual reviews sampled by the COV revealed that both of the merit criteria, Intellectual Merit and Broader Impacts, were mentioned in almost all the individual reviews. However, numerous inconsistencies were noted in the depth, specifics, and quality of comments that address both merit criteria and additional criteria outside the two main review elements. The Program Director leading the review panel should stress to reviewers that full sentences, paragraph-level thoughts, and more complete summaries are more appropriate, are more helpful to the Program Director, and allow more informative feedback to proposers. In many reviews, the consideration of Broader Impacts was more perfunctory than the reviews of Intellectual Merit. Very few of the jackets examined indicated that any reviewer considered the contents of the Data Management Plan as part of the evaluation process, either as contributing to the Broader Impacts of the proposed work or as contributing to the Intellectual Merit. Given that reviewers do consider other required documents as part of the evaluation (e.g., PI biographies), it would seem that the mandatory Data Management Plan criterion for NSF has not had much meaning or emphasis placed on it. This COV considers this a considerable lost opportunity, especially since one or more of NSF's "Big Ideas" focuses on data and the transformation of science and engineering due to data. The COV believes that the NSF program management team should require proposers to address the Data Management Plan in a substantive way and provide guidance to the reviewers as they evaluate the content of the Data Management Plan element. The EFRI program in particular can pave the way for the rest of NSF by developing a review process that supports the spirit of the goals of data management. b) In panel summaries? Without exception the panel summaries addressed both of the merit criteria, Intellectual Merit and Broader Impacts. They communicated the major strengths and weaknesses of the proposal and the application of review criteria. The variability in the depth, specifics, and quality of comments of panel summaries was considerably less than that observed in the individual reviews. However, in many Panel Summaries the consideration of Broader Impacts was more perfunctory than the reviews of Intellectual Merit. Summaries of funded proposals tended to be more detailed than reviews for weaker submissions. This is a lost opportunity to give proposers the valuable information they need to strengthen future proposals. c) In Program Officer review analyses? Program Officer review analysis generally mentioned both review criteria, but in many cases did not discuss any qualitative evaluation of the strengths and weaknesses of the proposal. More specific comments in the review analysis are encouraged, especially in the case of	**YES**

proposals with similar scores from the same panel but different funding outcomes. Comments: The majority of the Review Analyses and Context Statements did not include any narrative specific to the proposal under review.	

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? Comments: Although almost all of the individual reviews sampled by the COV included consideration of both Intellectual Merit and Broader Impacts, numerous inconsistencies were noted in the depth, specifics, and quality of comments that address both merit criteria and additional criteria outside the two main review elements. For example, some of the reviews are merely bulleted lists restating features of the proposal rather than an evaluation. In many reviews the consideration of Broader Impacts was more perfunctory than the reviews of Intellectual Merit. The individual reviewers should be encouraged to provide some level of detail in their reviews of all the EFMA/EFRI review requirements (e.g., specific, critical and constructive comments on Intellectual Merits, Broader Impacts, and additional review criteria in the solicitation).	**YES**
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: The panel summaries examined did a good job of communicating the major strengths and weaknesses of the proposal under review. The variability in the depth of panel summaries was considerably less than that observed in the individual reviews. However, in many Panel Summaries the consideration of Broader Impacts was more perfunctory than the consideration of Intellectual Merit. The panels from across different programs should be given more consistent guidance for preparing the panel summary.	**YES**

5. Does the documentation in the jacket provide the rationale for the award/decline decision? *[Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.]* Comments: For the majority of reviews, the decisions rendered by the review process were justified and supported by documentation in the eJackets. Sufficient details on the review process were contained in the Panel Summaries to support the decisions. However, in more than one case, it was challenging to reconcile the scores and final dispositions with the reviewers' narratives.	**YES**

6. Does the documentation to the PI provide the rationale for the award/decline decision? *[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 in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.]* Comments: See response to Question 5.	**YES**
7. Additional comments on the quality and effectiveness of the program's use of merit review process: None	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

SELECTION OF REVIEWERS	**YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE**
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: Diversity in disciplinary backgrounds is very positive. Kudos to NSF for doing a good job finding a number of high quality reviewers. The scientific and engineering expertise on the panel is appropriate for reviewing these proposals. One opportunity for improvement would be relate to promoting a culture of inclusivity. This would be enabled by a higher response rate on reviewer self-reporting of gender/race. This is discussed in more detail in Question II.3.	**YES**
2. Did the program recognize and resolve conflicts of interest when appropriate? Comments: The COV applauds the efforts on part of the EFMA program directors to identify a suitable reviewer pool for their ground-breaking and complex programs. The management of conflicts and the breadth of the evaluation process at various steps create unique challenges for which EFMA has developed processes that appear to be working very well.	**YES**
3. Additional comments on reviewer selection: The COV was very enthusiastic about the nature of the review pool for the REM program and saw it as novel way of broadening reach of NSF into K-12 areas. The involvement of high school teachers in the review of proposals was viewed as exceptional and should be continued. The COV noted that many of the Broader Impacts narratives were generic, and their evaluation by reviewers seemed perfunctory. Boiler-plate reviews of the Broader Impacts criterion is an NSF-wide issue. It may be worth cultivating a community of scientists and engineers who can do this well. EFMA should consider recruiting reviewers who have experience/expertise not only in a technical area, but also in the education or policy issues associated with the technical area.	

The COV identified an opportunity to broaden the representation of the reviewer pool by identifying additional reviewers with broad scientific expertise to augment those who have more typically come from the specific technical areas covered in the proposal topics. For example, evaluation that includes assessment of a proposal's articulation of their scientific ideas *in a manner accessible to a wider, scientifically literate but not domain expert community*, could serve to strengthen both the overall evaluation process and the ultimate impact of the work. Efforts to draw such reviewers from underrepresented regions and institutions could also serve to further broaden the reach of NSF by expanding the pool of individuals contributing to NSF's processes. There may even be panelists who are expert in evaluation of "broader impacts," but perhaps less knowledgeable about the specifics of the science. Such reviewers would ensure the Broader Impacts receive an appropriate and better-weighted review.

Some of these issues of diversity in the reviewer pool were noted in the 2014 COV report, emphasizing perhaps a need for alternative, non-technical, viewpoints to better consider the impact and transformative claims:

> "Part of the COV felt increased industry involvement (including lawyers, venture capitalists, business development professionals, technology transfer experts, scientists and engineers) would provide critical commercial assessments of the technical feasibility, technology readiness level, engineered systems design, optimization/performance goal, market need, industry fit, application practicality and commercialization gaps thereby improving the success of post-EFRI translation of early technologies into applications."

NSF reports the diversity (gender/ethnic status) of reviewers, however, the rate of self-reporting of race and gender is low enough that the numbers do not have much meaning. Although such reporting is optional, it would still benefit NSF's overall objectives to find ways to encourage a higher rate of self-reporting. The COV suggests that NSF re-examine the process of identification and the form used to see if there are ways to have more inclusive choices for race and gender. The COV suggests having the program director emphasize at the panel meeting how and why this matters to the NSF and encourage panelists to respond.

The 2014 COV review raised, but did not firmly address, the issue of industry participation on panels. Does this remain an issue? Ideally, panels should contain a spread of panelists from academia, industry, and national labs. Coupled with the suggestion above, this may be expanded to include appropriate panelists from institutions in EPSCoR states, HBCUs, HSIs, and tribal colleges.

The 2014 COV noted:

> "Participation by organization type was more difficult to evaluate given the broad grouping (business, state, local, foreign, other) versus PhD institutions in the statistical analysis provided. Hence, it was challenging to respond to the previous COV's recommendation for expanding industry participation on review panels. It is unclear what efforts were made to increase industry involvement and what the outcomes were."

This remains difficult to assess.

III. Questions concerning the management of the program under review. Please comment on the following:

MANAGEMENT OF THE PROGRAM UNDER REVIEW
1. Management of the program. Comments: *[Note: We encourage the COV to refer to relevant documents available at the SharePoint site such as Program Solicitations for general information, as well as Diary Notes and Correspondence in the jackets that provide information about the management of the specific projects.]* The leadership philosophy is to spawn high-risk innovation to fuel large-scale programs for far-reaching impact in a variety of fields across the Engineering Directorate and NSF. The EFMA Office employs an innovative collaborative approach that leverages the expertise of PDs across disparate divisions, unifying personnel in a common vision using methods that do not unduly burden divisional resources or impact priorities. EFRI, GERMINATION, and REM are all innovative programs that bring visibility to EFMA, the Engineering Directorate, and NSF. The EFRI program, guided by the Office Head, strategically supports the important emerging areas of science and engineering in which the engineering disciplines play a central role. The Office aims to provide transformative opportunities in new areas of fundamental or applied research, fostering new industries or capabilities that result in a leadership position for the country and facilitating significant progress in areas of national need or in the identification of grand challenges. The EFMA/EFRI program is focused on strategic investments with the potential for a significant benefit to the scientific community for addressing multidisciplinary research topics. With these ambitious goals, the management of EFMA/EFRI offers several unique challenges for NSF Program Management in its efforts to canvas this vast frontier and design an investment strategy. In addition to the Program Director (PD) in the EFMA office, it effectively utilizes PDs from ENG Divisions. The willingness and support of the PDs and their Division Directors is a major factor in the successful operation of the EFMA/EFRI programs. The EFMA Office and participating PDs are very committed and passionate about developing high-risk and transformative research in emerging research areas. It is the view of this COV that the EFMA/EFRI program is very well managed, achieves transparency, and attracts proposals from the highest quality research investigators. The newer REM and GERMINATION programs show all signs of sharing this management philosophy of innovation and impact.
2. Responsiveness of the program to emerging research and education opportunities. Comments: There are no obvious problems that would justify substantial re-thinking or revision of EFMA's

operations. Newer program elements demonstrated quite significant creativity (REM, GERMINATION) and were viewed quite positively. The program is being managed well, with the program directors intimately familiar with the various elements, performers, and projects.

There were numerous compliments about the EFRI topic selection process. The multi-phase process seems to be yielding a bounty of ideas, some of which do not find their way into EFRI but have impact by influencing other programs. The engagement of PDs from different divisions in ENG is a unique strength of the program.

It was also noted that a macro analysis or trend analysis might yield further insights about cross-cutting problems worthy of NSF investment.

What started as EFRI has grown to become EFMA. The leadership and vision to expand and focus on broader impacts through REM and GERMINATION has resulted in a set of programs unlike anything elsewhere in NSF: cutting edge, innovative, engaged in outreach, cross-division and cross-directorate.

Given all of this excellent work, the question one naturally asks is “can we do more?” Can the impact be expanded without altering the character of the core programs? We believe this question merits discussion across EFMA.

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

Comments:

The EFRI program approach to defining its solicitation and portfolio structure is unique among programs in NSF/ENG and perhaps NSF as a whole. The application of the process of open solicitation, peer-based evaluation, and a Blue Ribbon Panel to the generation of topics creates multiple opportunities to incentivize the research community, foster more disruptive thinking, and broadly sample the landscape for truly “frontier” ideas. Use of anonymity (i.e., the blind evaluation of topics, without knowledge of the submitting individuals or organizations) at the stage of the review and evaluation of the topic ideas was applauded.

Once the topics are identified, the selection of awardees and the creation of a project portfolio is done in a manner that is an exemplary model for the NSF peer review process.

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

Comments:

The 2014 COV noted

> “The COV feels the 4-year award duration is appropriate. Funding levels could possibly increase with inflation or other costs but not decrease under the current $2M level.”

At the time of the 2018 COV, this figure still had not changed and program awards remain at the $2M maximum level (which is the normal level to which most submitters propose). This was noted as concerning to the COV, in concurrence with the 2014 findings. When adjusted for inflation, these funds do not go as far; and certainly, if there are significant instrumentation or hardware needs, the static budgets could be problematic.

The 2014 COV noted:

"The COV recommends EFRI more effectively reach out to a wider community for idea generation and more effectively inform the community once the topics are selected."

The 2018 COV notes that some of these issues were addressed though expansion of the topic solicitation and selection process and the investment in the GERMINATION program.

The 2014 COV noted:

"A future challenge for EFRI may be how to best build and prepare for a next-generation topic when the research community must be built from a nascent pool of investigators, or novel technologies must be developed from the ground up."

Again, this is a difficult problem and it seems to be a focus for the GERMINATION effort. The GERMINATION effort, however, has only been done as a set of EAGERs tacked onto the EFRI program. The COV believes that GERMINATION might merit a program of its own and consideration in a wider ENG and NSF way.

The 2014 COV noted:

"EFRI should also consider developing a strategy for "life after EFRI" for its portfolio so that the resources available for its annual solicitation can remain robust."

This issue came up in the 2018 COV. It is recommended that survey instruments and other assessment methods be developed to track the impact of the program and "life after" for awardees. It would be valuable for some of these survey results to be made public.

The 2014 COV noted:

"As previously described, the COV recommends simplifying the preliminary proposal process to make it less burdensome on PIs, NSF staff, and reviewers. Concepts for simplification include eliminating the need for a detailed budget and developing evaluation criteria for pre-proposals that weigh more on the transformative nature and impacts of the idea than on the feasibility. Full proposal reviews can put more emphasis on feasibility."

This came up in detail with the 2018 COV. It seemed to some members of this COV that there is still a considerable amount of effort, time, and money going into the development of pre-proposals that are not selected and full proposals that are not funded. Even at current funding rates, there are large costs to proposing institutions in faculty and staff time in sponsored programs offices. As the number of pre-proposal submissions is not limited, there are many of these. When considered end-to-end (pre-proposals to awards), the overall funding rate is low and the collective effort is substantial. Given that the program's current process yields a bounty of excellent proposals – resulting in a very competitive process – the COV recommends exploring ways in which the pre-proposal submission process can be made even easier.

Additionally, it would be worth considering by what criteria proposals are invited for full submissions. That might warrant increasing the stringency of this part of the pipeline in order to reduce workload and produce a higher funding rate for the submitted full proposals.

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity? Comments: The COV reviewed the award distribution and determined that there is a balance of awards across disciplines measured in terms of EFMA PIs' department affiliation (based on the submissions). Specifically: • The topics drive the disciplines represented in the submitted proposals, which is a reasonable balance for each topic. A review of topics over multiple years results in a reasonable distribution across all disciplines. The COV felt that there was a good balance of topics since the inception of the EFRI / EFMA program. • If additional funding were available there could be a greater distribution of topics during the time period reviewed.	**YES**
2. Are awards appropriate in size and duration for the scope of the projects? Comments: The COV felt that in many cases that the size and duration for the scope of the projects is reasonable. There are some questions as to whether the PD should have the latitude to make "exceptions" to the seemingly rigid 4-year $500k/year award based on the specific needs and likely trajectory of a project. • **EFRI:** This initiative was created to attract the attention of the most creative and capable researchers. The size of the award has not grown with inflation since the inception of EFRI. There should be purposeful discussion and decisions about whether the program should grow to achieve true innovation, while maintaining spirit of agility. Examples include planned award budget growth to be more attractive to leading institutions and resources required to do cutting-edge research. • **REM:** The award amount of $100k is appropriate, with the emphasis that it is to be primarily spent on the participants. • **GERMINATION**: This is an innovative program within the spirit of the broader EFMA goals. The program directors deserve credit for taking the initiative to launch the initiative through EAGER. Long-term	**Conditional YES**

programming of GERMINATION needs a more stable funding source either through topic selection through EFRI or other sources to provide the flexibility, size, and duration to make an impact. The COV recommends that EFMA leadership identify ways to make the impact of GERMINATION more significant.	
3. Does the program portfolio include awards for projects that are innovative or potentially transformative? Comments: The overall portfolio includes examples of innovative and transformative outcomes including tools, technologies and products that have been translated to and adopted by industry. This is arguably one of the ultimate measures of success in innovation and transformation. Given the highly successful outcomes of the EFRI Origami Design for Integration of Self-assembling Systems for Engineering Innovation (ODISSEI) program, EFRI provided supplemental funding opportunities for awardees to partner with industry to translate cutting-edge research to real-world technology. Commendably, EFRI sought out and partnered with the Air Force Office of Scientific Research to ensure the offering design and funding were commensurate with technology translation and proof-of-concept demonstration of advanced technologies.	**YES**
4. Does the program portfolio include inter- and multi-disciplinary projects? Comments: There is a good balance of inter- and multi-disciplinary projects.	**YES**
5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? Comments: The COV noted that, for the most part, the distribution of awards reflects the distribution of the geographic locations from which the applications are submitted. The distribution of the applicants, however, has large disparities.	**YES**
6. Does the program portfolio have an appropriate balance of awards to different types of institutions? Comments:	**Conditional YES**

As with the last COV, EFMA/EFRI awards are primarily found to be in PhD and research-intensive PhD institutions, with some involvement of Masters institutions. EFMA should continue to strive to broaden participation of institution types, especially for the REM and GERMINATION programs. Outreach could improve the balance across the EFRI / REM / GERMINATION programs.	
7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? *[Note: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia, and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award.]* Comments: The COV felt that the balance of awards is consistent with the NSF-wide distribution.	**YES**
8. Does the program portfolio include projects that integrate research and education? Comments: All EFMA proposals address the integration of research and education. In addition, GERMINATION in particular provides an opportunity to become a vehicle in faculty development to provide leadership capabilities to lead groups, scope questions, and develop successful proposals. GERMINATION has the potential to groom leaders from URM groups, minority serving institutions, Masters-level institutions, and REP (Research Experiences for Professors) for institutions other than research-intensive institutions. There is a great opportunity for GERMINATION to become systemic within EFMA and the broader NSF community.	**YES**
9. Does the program portfolio have appropriate participation of underrepresented groups[1]? Comments: The low response rate in the self-reporting makes this criterion difficult to	**Difficult to Assess**

[1] NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

assess. The COV suggestions that EFMA program directors and partners be proactive in communicating the importance of self-reporting. Also see the response to Question II.3.	
10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. Comments: The COV discussed the breadth of the program and its different initiatives. We concluded that the program is relevant to national priorities and has an effective process in place to ensure that this relevance is maintained. Specifically: • The EFRI topic selection is an open and transparent process to help identify the emerging research areas that will have the greatest impact. • The creation of GERMINATION and REM is a direct response to the need for a diversified pool of investigators who can ask research questions that have the potential to make a broad and substantial societal impact.	**YES**
11. Additional comments on the quality of the projects or the balance of the portfolio: Because EFMA has developed unique and groundbreaking programs, it is important to document both the successes and areas for improvement. One can easily argue that this is more important for GERMINATION, REM, and EFRI than for more conventional programs because the underlying program models, as well as the specific research funded, are being tested. The value of understanding the impact of EFMA programs on the Engineering Directorate, all of NSF, the wider scientific community, commercial activity, and society should override any perceived burden of the tracking required to gather this data and conduct these assessments. To capture the full impact of REM, GERMINATION, and EFRI, methods should be developed to track the individual investigators and their contributions through existing databases at NSF and other agencies, in order to assess the impact of EFMA programs on the future careers of these investigators and participants, on possible commercial activity, and on society more broadly. The data will be valuable for future efforts to guide, sustain, and/or expand the EFMA programs.	

OTHER TOPICS

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

   None

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.

   EFRI solicitation funding rates have ranged from similar-to to more-than-double that of ENG. This presumably results from the pre-proposal process and smaller number of applicants with expertise in the focused topics, and should not be interpreted as diminished interest in the program or the quality of the applications.

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

   The 2-minute video on Broader Impacts did not communicate NSF's commitment to encouraging PIs to address Broader Impacts in a significant way. Rather, the video came across as a cautionary note for reviewers to find ways not to "ding" proposals on the Broader Impacts criterion.

   EFMA should not lose the opportunity to coordinate with the Director of NSF to develop a career map inclusive of high school through faculty, including leveraging existing NSF-wide programs (ADVANCE, AGEP, EFRI, GERMINATION, INCLUDES, LSAMP, NRT, REU, REM, RET, etc.) to attract underrepresented groups (women, minorities, low-income).

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

   None

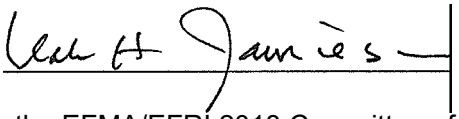
5. NSF would appreciate your comments on how to improve the COV review process, format and report template.

   The template includes redundant questions. The compartmentalized questions drive discussion away from big-picture, over-arching issues and opportunities. For example, the template missed the opportunity to foster thinking about how the EFMA programs, taken together, could create a framework for a career-long roadmap.

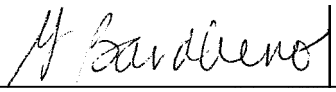
The Committee of Visitors is part of a Federal advisory committee. The function of Federal advisory committees is advisory only. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the Advisory Committee and do not necessarily reflect the views of the National Science Foundation.

SIGNATURE BLOCK:

EFMA/EFRI 2018 Committee of Visitors (Chair)



For the EFMA/EFRI 2018 Committee of Visitors
Dr. Leah Jamieson
Chair



For the EFMA/EFRI 2018 Committee of Visitors
Dr. Gilda Barabino
Co-Chair

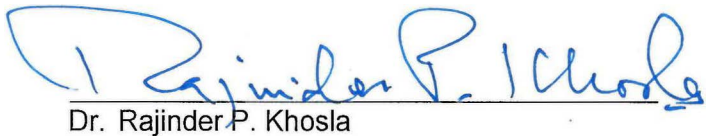
SIGNATURE BLOCK:

EFMA/EFRI 2018 Committee of Visitors (Other than the Chairs)

Dr. Dawn R. Applegate

Dr. William Herman

Dr. Craig A. Hoffman

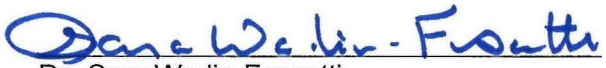


Dr. Rajinder P. Khosla

Dr. Melur K. Ramasubramanian

Dr. Vittal Rao

Dr. William C. Regli



Dr. Sara Wadia-Fascetti