EXECUTIVE SUMMARY

It is the unanimous judgment of the 2008 Advisory Committee for GPRA Performance Assessment (AC/GPA) that the National Science Foundation successfully met its performance objectives by demonstrating *significant achievement* for each of the following three long-term, qualitative, strategic outcome goals in its 2006-2011 Strategic Plan:

- **DISCOVERY**: Fostering research that will advance the frontiers of knowledge, emphasizing areas of greatest opportunity and potential benefit and establishing the nation as a global leader in fundamental and transformation science and engineering.
- **LEARNING**: Cultivating a world-class, broadly inclusive science and engineering workforce, and expand the scientific literacy of all citizens.
- **RESEARCH INFRASTRUCTURE**: Building the nation's research capability through critical investments in advanced instrumentation, facilities, cyberinfrastructure and experimental tools.

Further details on the performance evaluation, including several performance or program "highlights" as outstanding examples within the portfolio of projects funded, are presented in subsequent sections of this report. Those sections represent the deliberations of three subgroups organized according to the three goals. Based on the deliberations of each subgroup, and after discussion and evaluation by the Committee as a whole, the performance opinions of each subgroup were supported unanimously by the entire AC/GPA Committee.

The Committee did not form an assessment or opinion of NSF's performance under the fourth goal: *Stewardship*, which is: *to support excellence in science and engineering research and education through a capable and responsive organization*. Performance outcomes under Stewardship are reported using a number of measures and milestones developed internally within NSF.

The Committee's assessments were made during its June 19 and 20, 2008 meetings to consider the activities and achievements of NSF relative to its performance under the Government Performance and Results Act (GPRA). Our charge was to assess NSF's performance with regard to the three long-term strategic outcome goals for FY 2008 using primarily performance highlights prepared by NSF program officers and staff and to provide a report to the NSF Director. We were also charged, at our option, to discuss three additional topics: transformative research, broadening participation and societal benefits of NSF investments.

The 2008 AC/GPA was comprised of 20 members, each of whom had strong academic credentials and substantial experience in academia, government, and/or industry. More than half the AC/GPA members presently serve on advisory committees within the Foundation. As a group, the Committee is familiar with NSF processes and procedures

and, as individuals, the Committee members have personal experience with NSF and a wide range of its programs.

NSF Response to 2007 AC/GPA Recommendations

A key part of overall performance is following up to be sure the agency has adequately responded to the prior year's recommendations. The recommendations of the 2007 AC/GPA Committee are categorized as follows:
Summary of FY 2007 Recommendations

1. *Development of AC/GPA Evaluation Criteria and a Performance Assessment Framework:* Establish evaluation criteria and a framework within which NSF's overall performance goals could be better assessed and both select and organize program highlights within that framework cutting across all significant activities and investment priorities of the agency.
2. *Enhancing "Broader Impacts" of NSF Research through "Broadening Participation":* Establish initiatives and formalized programs to bring about more emphasis on enhancing participation by minorities and those underrepresented in science, technology, engineering, and mathematics (STEM) fields. This would apply to investigators and universities and would also extend geographic representation.
3. *Transformative Research*: While recognizing that the agency is already focused on conducting *high risk / high reward* programs, the Committee felt that the term "transformative research" lacked adequate definition, and that existing "selection" processes and systems within NSF would need to be modified to further encourage award of these relatively undefined types of programs that have uncertain outcomes.

The Committee is pleased to report that each of these recommendations has been fully addressed, or is being addressed, by NSF staff and NSF management to the satisfaction of the Committee.

Regarding the first recommendation, NSF staff developed specific evaluation criteria within a well structured performance assessment framework. This was surely a difficult and time consuming task, but was necessary in preparation for our 2008 AC/GPA evaluation. The new framework for the 2006-2011 Strategic Plan was utilized this year and utilized successfully. We are pleased to report that the review process went much more smoothly this year as a result. The distribution of program highlights across each of the investment priorities and each of the performance criteria was sufficiently broad to give the Committee the information it needed to arrive at its opinions for each element of the framework, and yet deep enough to evaluate the adequacy of performance within each major goal.

Regarding *broadening participation*, the Chair was of the opinion that the initiatives in place were already quite substantial and over time should result in substantial outcomes and improvements. Because time is needed for these initiatives to take effect and produce results, this topic was not selected as a major topic of discussion for the

Committee this year, although it was included within the context of our overall performance discussions.

Regarding *transformative research*, the same was also true. The recently implemented definitions and transformative research initiatives appear fully responsive to the Committee's recommendations in 2007. All performance highlights included an assessment by program managers of the transformative nature of the research conducted.

New review process for 2008: Committee of Visitor (COV) Reporting, Review, and Assessment

Every program across the Foundation must undergo an evaluation by a Committee of Visitors (COV) once every three years. Each COV, which is composed of active researchers in the field being reviewed, submits a detailed written report to the appropriate advisory committee. Each COV report generally contains extensive critiques of the division/program's effectiveness with regard to both "process" and "outcomes."

Each year the AC/GPA is provided with COV reports going back several years for its review. However, no formal AC/GPA review process has previously been established to focus on review of the COV reports – which might offer the opportunity for rich insights into agency performance processes and outcomes. Moreover, while program highlights present selected programs as examples of outstanding performance (e.g. "best of the best"), the COV process involves a random selection of program "jackets" for review and might be considered more representative of "average performance." It was hoped that as part of its due diligence efforts, a deep review of COV reports by an AC/GPA subgroup would provide a more representative and deeper understanding of NSF performance as compared to a review of selected performance highlights alone.

2008 Recommendations

1. Track Future Outcomes from "People" Trained and Supported by the Foundation

It is the Committee's unanimous opinion that the "outcomes" of NSF funding are not only the scientific results that come from the funded research activity, but also the training and commitment of the people involved – the people outcome. People who do the work of funded NSF programs, whether a project is successful or fails, learn from the process and become committed to careers in STEM research and innovation. This often results in a lifetime of future contributions which apparently is not being measured when we assess NSF performance outcomes year to year. These "people contributions" extend not only to the principal investigators, but also to the advisors and professors, particularly junior professors, who oversee the work, as well as to graduate students, staff, and other researchers. We observe that the current performance outcomes do not capture this essential "value added" aspect of NSF investments. We strongly recommend that NSF consider some way of capturing these longer term "development of people" outcomes too, which could well outweigh the technical outcomes or research results from a project.

2. Consider Ways to Convey the Long View of NSF Investments in Science and Engineering

Highlights are an excellent way to document and illustrate the breadth of NSF's investment in a wide variety of fields and disciplines at a particular point in time. However, Committee members also expressed interest in finding ways to demonstrate the long-term impacts of NSF support. By seeding new ideas, supporting novel approaches, and encouraging exploration of those ideas over substantial periods of time, NSF has supported both people and discoveries that have had profound impact on science and society. Some examples are biodiversity, nano sciences and engineering, and information and communication technologies. Together with NSF staff, we look forward to discussing ways to tell this deeper, more comprehensive story of scientific advancement supported by NSF funding.

3. Reconsider the Format and Value of COV Reports

The COV Subgroup read all 32 COV reports from 2006-2008 in full, discussed the results, and reported key findings to the Committee of the Whole. While the COV Subgroup reviewed Part A of each COV report, which addresses mostly process, it focused its efforts in particular on Part B, which addresses outcomes. In terms of process information reviewed, the Committee recommends that these reports be reviewed on an annual basis at the Director level in order to gain insight into common process issues that may affect performance on an agency-wide basis. In addition, the Committee concluded that Part B of these reports is not very informative and provides little, in fact far less, outcome information than the AC/GPA Committee receives in the performance highlights. Accordingly, the Committee believes that Part B of the COV reports should either be enhanced (which might not be feasible given the typical COV review process) or eliminated.

4. Continue to Improve Assessment Processes and Contextual Information Available to the AC/GPA

NSF has continually improved the processes by which the AC/GPA receives and reviews information about performance under the strategic goals. The Committee recommends that the methods and guidelines that program officers use to select and describe highlights be shared with Committee members as part of their preparation for the assessment to reduce time spent at the annual meeting educating new members regarding these processes and procedures. NSF should continue to provide access to other reports that it prepares or commissions, which would give the Committee a broader context in which to consider performance under the strategic goals. In addition, the presence of program officers during the Committee meeting is invaluable to members as they review and discuss the material under review, and this practice should be continued in future years.

Acknowledgements

The Committee is most grateful to the NSF staff for the tremendous effort made in preparing the AC/GPA website and providing all the documentation which was assembled for review in advance of the formal meeting. There were many organizational meetings and subcommittee telephone calls needed to prepare our efforts so face to face meeting time could focus on group analysis, collaboration, and consensus building. In particular, we would like to extend our deepest gratitude to Pat Tsuchitani and Jennifer Brostek. They worked diligently to gather data, make arrangements, and help prepare and edit this report. They deserve personal recognition for their contributions to the processes and to the final product. We look forward to working with them again next year. We also thank Michael Sieverts for his insights and advice and presentations during the meeting. Lastly, we thank the NSF program staff for their thoughtful reporting of "highlights," and NSF's senior leadership, Dr. Arden L. Bement, Jr. and Dr. Kathie L. Olsen, for their commitment to this effort and for their insightful remarks at the end of our meeting.