

**National Science Foundation
Directorate for Engineering
4201 Wilson Boulevard
Suite 505
Arlington, VA 22230**

March 3, 2005

Dr. Linda P. B. Katehi
John A. Edwardson Dean of Engineering
Purdue University
Engineering Administration Building, 101
West Lafayette, IN 47907-2016

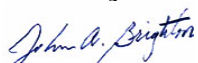
Dear Dr. Katehi:

Thank you for transmitting the NS&E COV Report. I appreciate your support for NS&E and we will ensure that this effort continues to be highly successful.

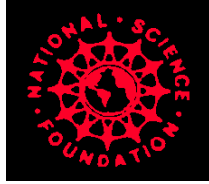
I have attached a response to the recommendations in the NS&E COV report that was prepared by Mike Roco, Senior Advisor in the ENG OAD. I concur with this document and adopt it as the official response of the Directorate for Engineering.

I wish to express my appreciation to the individuals who participated in the COV review. This process is critical to the management of the Directorate and will help to guide our future decision-making.

Sincerely,



John A. Brighton
Assistant Director for Engineering



MEMORANDUM

TO: John A. Brighton, Assistant Director, ENG
SMIG representative for Nanoscale Science and Engineering

FROM: Mihail C. Roco, Senior Advisor for Nanotechnology, Chair NS&E Group

DATE: January 21, 2005

SUBJECT: Response to the Report of the Committee of Visitors for the
Nanoscale Science and Engineering (NS&E) Priority Area (2001-2004)

On behalf of the NS&E Group of NSF, I thank the Committee of Visitors (CoV) for their thoughtful and thorough report covering FY 2001-2003, and for the opportunities for improvement it provides the NS&E Priority Area and the National Science Foundation (NSF). This is the first three-year cycle of CoV evaluation of NS&E. We are delighted that the CoV states: **“The CoV found all aspects of NSF's performance to be of exceptionally high quality.** NSF has done an extraordinary job in building nanoscale science and engineering, a nanoscience community, and the tradition of interdisciplinary collaboration. The NS&E program should be praised for setting the standard in this regard, and CoV members used words like "off scale" and "outstanding job" to describe the overall impact of the NS&E program.”

We are also pleased that CoV found that “Two significant and enduring results have emerged from this investment, which may be viewed as over and above the usual measures of people, tools, and ideas. They are the creation of a nanoscale science and engineering community, and the fostering of a strong culture of interdisciplinary research.” The NS&E program is complex, highly distributed, involves program managers from seven Directorates, and requires coordination with other Federal agencies. We will continue to build on the prior results to support science and engineering both through solicitations and NSF core programs.

The integrative approach of the NSE program is recognized by the CoV: “The overall integrity and efficiency of the program's processes and management meets the highest of standards. The CoV observed that the distributed funding mechanism used for NS&E awards is very positive because it promotes collaboration between program officers and allows interdisciplinary proposals to come to the surface.”

The CoV raised several review issues related to risk aversion in review panels, and stated that the number of underrepresented minorities is not high enough while the percentages for women PIs and new PIs is good. The risk aversion issue has been addressed by revising the description of the program and the review requirements for the Nanoscale Exploratory Research (NER) component in the program solicitation, and encouraging support for exploratory research in the

instructions given to the review panels. We will provide additional instructions particularly to the NER review panels to give increased consideration to high risk – high return projects. Also, NSECs include explicit support for “seed funding and emerging areas’ that provides an opportunity for high-risk research. NSF will continue to emphasize this opportunity. The proactive approach for encouraging minority participation in submitting proposals and in the NSF review process will continue. The NS&E awards for the interdisciplinary research teams have about 13% minority PI or co-PI, a percentage that is over the NSF average for all programs.

The CoV highlighted the substantial outputs and outcomes of the NSF’s investment in the NS&E, in both research and education. We are pleased that the results of the NS&E program solicitation have broad implications in the research portfolio (“quality and relevance..is extremely high”), changing the paradigm in education, and creating the workforce pipeline for the filed, and contributing to new tool development.

The CoV encouraged a larger number of awards in the areas of biosystems at the nanoscale, nanomanufacturing, nanoscale processes in the environment, and societal and educational implications, and recognized that same steps have been taken to address this. The high proposal pressure with relatively low award rate for biosystems at the nanoscale was caused by the unexpectedly large number of proposals coupled with relatively low funding from the Biological Sciences Directorate. To address this need, other directorates have provided additional co-funding in this area; the Biological Sciences Directorate also provides substantial support for nano-biosystem activities in its core programs. In the other areas listed above, the success rates were higher than the NS&E average, but the number of proposals was lower. Several measures have been taken to increase the number of proposals submitted in those areas, including adding a new theme on nanomanufacturing in the program solicitation in FY 2002, creating a new program on nanomanufacturing in the Engineering Directorate in the same year, dedicating the centers competition to specific topics under represented in the overall research portfolio (nanomanufacturing since FY 2003 and societal implications in FY 2005), and increasing the number of proposals allowed to be submitted by institutions if the topics are on environment or societal implications since FY 2003.

The CoV recognized the significant role played by the NS&E program both at NSF and in the National Nanotechnology Initiative. The NNI review prepared by the National Academy (NAS/NRC) in 2002 is cited: “During the course of its evaluation, the committee was impressed with the leadership and the level of multiagency involvement in the NNI. Specifically, the committee commends the leadership of the NSF in the establishment of the multiagency National Science, Engineering and Technology (NSET) Subcommittee of the U.S. National Science and Technology Council as the primary coordinating mechanism for the NNI.” Our efforts in advancing the frontiers of science and engineering and developing multidisciplinary projects in collaboration with other agencies will continue to capitalize on that strength.

A detailed response to the CoV report is organized below in terms of the major topics highlighted in the Executive Summary of the CoV report. It includes a brief synopsis of those topics, and a brief response from the NS&E Group.

Topic In Executive Summary	NS&E Group Response
<p>A. The overall integrity and efficiency of the program's processes and management meets the highest of standards. The CoV observed that the distributed funding mechanism used for NS&E awards is very positive because it promotes collaboration between program officers and allows interdisciplinary proposals to come to the surface. Although the framework and context for review panels is provided by the program solicitations and the Management Plan, the CoV recommends that more detailed and tailored review forms be used for the different solicitations.</p>	<p>We will continue the distributed funding approach in the review process of the NS&E priority area as a way of encouraging interdisciplinary awards. The specific requirements for each mode of support are given in the program solicitation, management plan, and in the instructions given to the review panels. The coordinators for each mode of support will prepare more specific instructions for the review tailored to the respective mode of support.</p>
<p>The CoV found that educational components for all modes of support were given great significance and all the reviewers commented positively on them.</p>	<p>We encouraged integration of research and education in all NS&E themes. Beginning in FY 2004, in order to expand the scope of educational activities, we have added the program solicitation Nanoscale Science and Engineering Education (NSEE). The program component Nanotechnology Undergraduate Education was added one year earlier.</p>
<p>The time to decision for all modes of support was close to the NSF goal of six months. The NSF staff should be commended for this, particularly since for most of them the NS&E proposals represented additional workload with no additional staff.</p>	<p>We agree. The review process involved program officers and staff from all seven directorates, and an additional step in the review process for co-funding from various programs required several additional weeks beyond the usual review process.</p>
<p>There were some indications of risk aversion, even with the NER proposals.</p>	<p>The risk aversion issue has been addressed by revising the description of the program and the review requirements for the Nanoscale Exploratory Research (NER) component in the program solicitation, and encouraging support for exploratory research in the instructions given to the review panels. We will provide additional instructions particularly to the NER review panels to give increased consideration to high risk – high return projects. Also, NSECs include explicit support for “seed funding and emerging areas” that provides an opportunity for high-risk research. NSF will continue to emphasize this opportunity.</p>
<p>CoV questions the low number of industrial reviewers, particularly given the projected impact of nanotechnology on industrial innovation and economic development.</p>	<p>The number of available reviewers from industry is increasing and involving industry experts is being given greater emphasis by the NSE Group. For example, we have established collaboration with the Semiconductor Research Corporation and contact with other industry groups to provide industry reviewers.</p>
<p>Even though the award rate was good for new PIs and for women PIs, it is still not high enough for underrepresented minorities. The geographic diversity among awardees seems to be good, as does the balance between reviewers from different types of academic institutions.</p>	<p>We will continue to proactively encourage minority participation. The awards for the NS&E interdisciplinary research teams had about 13% minority PI or co-PI, percentage that is over two times the NSF average for all programs. In the same way, the award rates for women PIs and new PIs are above the respective NSF averages.</p>
<p>B. The outputs and outcomes of NSF's investments in NS&E are substantial. The NS&E programs had already profound impact on <u>people</u> and education. It is estimated that over 250 colleges and universities now have courses in nanoscale science and engineering, whereas there were none a decade</p>	<p>We will continue to focus on the research outcomes in key areas of relevance and on interdisciplinary educational programs from K to graduate level. This is a critical challenge for the NNI and NS&E.</p>

<p>earlier. The NS&E program has been pivotal in developing a skilled workforce and a public that is informed about nanoscale science and engineering. The number of scientists working in this area and the amazing web of interdisciplinary connections established are some of the best outcomes to date. The skilled workforce and the web of interactions are critical for maintaining U.S. leadership in this area.</p>	
<p>There are many significant and promising outcomes with respect to <u>ideas</u>. The ability systematically to control matter at the nanoscale has been a great success story. A growing set of nanoparticle synthesis strategies that didn't exist five to ten years ago now allow us to control size and composition and shape with precision and infinite variability. Overall, the quality and relevance of the NS&E portfolio is extremely high.</p>	<p>We will continue to support research focused on the frontiers of nanoscale science and engineering, and use peer review for all awards made.</p>
<p>There has also been some interesting new <u>tool</u> development to date from the NSEC, NIRT, NER, and NUE programs. It should be noted that the projects under review correlate well with the broad NNIN (Nanotechnology National Infrastructure Network) and NCN (Network for Computational Nanotechnology) programs and take advantage of them from a "tools" point of view. However, the CoV posits that there are many facilities, tools and infrastructures yet to be developed, and that these developments will be forthcoming in future years of the NS&E program.</p>	<p>The NS&E program solicitations to date were primarily dedicated to new research and education, and were complementary to several instrumentation and facility funding programs at NSF. We will increase the attention on development of new instrumentation and computer simulation tools in the future.</p>
<p>C. Other topics: The award rate for nano-bio proposals is very low. The high proposal pressure from the community and the small amount of funding available from the BIO Directorate conspire to create very low award rates for the theme area "Biosystems at the Nanoscale." This is particularly troublesome, as many CoV members identified the nano/bio area as one in which breakthroughs will occur and major advances will be made.</p>	<p>The high proposal pressure with relatively low award rate for the research theme on biosystems at the nanoscale was caused by the unexpectedly large number of proposals coupled with relatively low funding from the Biological Sciences Directorate. To address this need, other directorates have provided additional co-funding in this area; the Biological Sciences Directorate also provides substantial support for nano-biosystem activities in its core programs.</p>
<p>D. The NS&E program, as structured, includes a few areas that are not as well addressed as others. These gaps include nanoscale architectures that are embraced by an industrial "pull"; nanoscale processes in the environment; manufacturing processes at the nanoscale, and societal and educational implications of NS&E. To the credit of the NS&E program, steps have already been taken to address a number of these gaps.</p>	<p>The success rates were higher than the NS&E average for the areas nanoscale architectures, nanoscale processes in the environment, manufacturing processes at the nanoscale, and societal and educational implications, but the number of submitted proposals was lower. Several measures have been taken to increase the number of submitted proposals in those areas, including adding a new theme on nanomanufacturing in the program solicitation in FY 2002, creating a new program on nanomanufacturing in the Engineering Directorate in the same year, dedicating the centers competition to specific topics that are under represented in the overall research portfolio (nanomanufacturing since FY 2003 and societal implications in FY 2005), and increasing the number of proposals allowed to be submitted by institutions if the topics are on environment or societal implications since FY 2003.</p>

<p>Technology transfer industrial interactions have been good. There have been a number of successful spin-off companies from NS&E funded projects. However, the CoV expected to see a stronger participation of large industry and government labs, especially in the NSECs.</p>	<p>All NSECs are required to have industrial partners, and the small interdisciplinary teams are encouraged to develop partnerships with industry (see the NS&E program solicitation). In addition, the GOALI (Grant Opportunities for Academic Liaison with Industry) program partners with the NS&E. Furthermore, beginning with FY 2004, NSF included a new research and education theme on Silicon Nanoelectronics and Beyond and signed a Memorandum of Understanding with the Semiconductor Research Corporation for developing university-industry collaborations. The NS&E Group will emphasize the participation of industry and government labs in the future.</p>
---	--