Report of the Committee of Visitors
Division of Chemistry
National Science Foundation
February 3-5, 2004

I. Background

The Committee of Visitors (COV) for the Division of Chemistry met for three days to review actions taken on proposals handled by the Division during the three year period 2001-2003 and to review the outputs and outcomes of past and current Division investments. Appendix A is a list of COV members and Appendix B is the meeting agenda.

The specific questions that the COV was asked to address are:

a) The integrity and efficiency of processes used to solicit, review, recommend and document proposal actions, including such factors as selection of an adequate number of highly qualified reviewers who are free from bias and/or conflict of interest;
appropriate use of NSF merit review criteria;
documentation related to program officer decisions regarding awards and declines, and the scope, duration and size of projects;
balance of awards in terms of subject matter; emerging opportunities; high risk and innovation; size versus number of awards; new investigators; diversity of underrepresented groups; geographic distribution of principal investigators
overall technical management of the program.

b) The relationships between award decisions, program goals, and Foundation-wide programs and goals;

c) Results, in the form of outputs and outcomes of NSF investments for the relevant fiscal years, as they relate to the Foundation's current strategic goals and annual performance goals.

d) The significant impacts and advances that have developed since the previous COV review and are demonstrably linked to NSF investments, regardless of when these investments were made. Examples might include new products or processes, or new fields of research whose creation can be traced to the outputs and outcomes of NSF-supported projects over an extended period of time.

e) Response of the program(s) under review to recommendations of the previous COV review.

The sub-panels of the COV were formed into the following groups:

Organic and Macromolecular Chemistry
Physical Chemistry

Inorganic, Bioinorganic and Organometallic Chemistry
Analytical and Surface Chemistry, including Advanced Materials (AMP)
Chemical Instrumentation, Nanotechnology (NANO), and Information Technology Research (ITR)
Special Projects(SPO), Education and Collaborative Projects

Prior to the COV meeting, the members of the committee were provided with the Chemistry Division's annual report for FY 2001, FY 2002, and FY 2003. The previous COV report covering the years 1998-2000 (held February 12-14, 2001) was also provided.

The meeting of the COV began on February 3, 2004 with a review of the charge to the Committee by Judith Sunley, Executive Officer, Directorate of Mathematical and Physical Sciences. Members were then briefed on conflict of interest by Fae Korsmo, Staff Associate, Office of Integrative Activities. Art Ellis, Division Director of the Chemistry Division then gave an overview of the Division, followed by a discussion of the general procedures to be followed by Don Burland, Executive Officer of the Division. For the remaining part of the day, the COV then was separated into six sub-panels. Each subpanel was then briefed on the program by a Program Director. The COV subpanel members then studied a representative sample of "jackets" containing information on proposals acted on in the previous three years. These included a few proposals that were deemed obvious for funding, borderline for funding, borderline declined, and obvious declined. In this way, the COV received a quick education in the work of the Division, including a taste of the difficult decisions that had to be made.

On the second day, the morning was spent in preparing a report, referred to as the First Round Report that answered the core questions for the COV. Later that day, the members of the COV were reformed into six new sub-panels so that each member of the COV was able to review jackets in another area, with which he or she had some secondary expertise. These new sub-panels prepared a Second Round Report in the late afternoon,

In the morning of the third day, each First Round panel met again with the chair of the Second Round panel to merge the two Reports into the Final Report. The composition of both sets of sub-panels is given in Appendix C, and the final merged reports are given in Appendix D. At 10 am, the COV met to discuss the general issues that arose from the discussions of the sub-panels with the staff of the Chemistry Division. The COV then briefed Judith Sunley on the findings and adjourned.

The COV members expressed gratitude to the administrative and technical staff of the Division for their help and hospitality during the meeting. They also were appreciative of the candor and helpfulness of the

Program Officers, Executive Officer, and Division Director in all their discussions.

II. General Conclusions

The Division is operating extremely well. The COV was impressed with the quality and effectiveness of the Program Officers, Executive Officer, and Division Director in managing a large portfolio of tasks. Chemistry Division Director Arthur B. Ellis has developed a responsive and efficient organization and earned the respect of the community. The COV strongly supports his continued leadership. We were impressed by the fact that, in spite of the large increase in number of proposals (with a constant staff size), the percentage that are acted on within six months has been over 70% in the last two years. This is particularly noteworthy when one takes into account the huge workload with which the program officers have to deal and the large number of proposals arriving simultaneously right before the yearly deadlines.

The number of outstanding single investigator proposals that should be funded but are declined due to budget constraints is large. At the same time, the Division supports other types of grants, such as the new Chemical Bonding Centers, Collaborative Research in Chemistry, Environmental Molecular Science Institutes, Undergraduate Research Centers and Discovery Corps Postdoctoral and Senior Fellowships. All these activities are worthwhile. We strongly support the continued emphasis on single investigator grants. . The program should continue to stress hypothesis-driven research initiated by individual investigators. Innovations arising from research supported by this program have had a clear impact on the national and international competitiveness of the United States. The track record of Nobel Laureates historically funded by this program supports this mode of operation. In addition, interdisciplinary and collaborative research programs will continue to grow. The only long-range solution is an increase in the budget of the Division. We do, of course, understand that this is difficult. The Division should continue its efforts to make the strengths and achievements of the chemistry community known.

Infrastructure and instrumentation continues to be a strong suit in the chemistry division grants both in the CRIF and individual grants programs. In addition, the success that the chemistry community has in MRI proposals is a welcome addition to these. The new NSF programs for funding mid-range instrumentation ($2-100M) could be another area in which the community takes part, and the hope is that the Division will provide a process by which the community can define their future needs and modes of usage for major instrumentation of this magnitude.

The last COV suggested removing the need for 50% institutional matching for instruments over $80K. This has been accomplished; however, it is a double edge sword—on one hand it allows full NSF

support for an instrument, on the other hand, fewer total instruments may eventually be funded in this model. It is too soon to assess the effect of this, but we anticipate that the Division will follow the trends and report its findings. We were also concerned about the support of technical personnel to run the instruments that are funded. Should these costs be considered in the instrument grants themselves or should institutions be asked to commit to a portion of the personnel and maintenance support for instruments?

The COV is pleased with the manner in which the Division has reacted to the worries of the community caused by the explicit introduction of the broader impacts criterion in the merit review. The letter to the community in 2002 from the Director with examples of such impacts has decreased this anxiety. However, the COV found that some reviewers of proposals were still uncertain of how to interpret this criterion and how to weigh its contribution to the overall score for the proposal. More needs to be done to educate the community. Perhaps an instruction sheet for proposal submitters and reviewers could be constructed that explains this issue in more detail. More generally, an instruction sheet that provides reviewers with a set of criteria to use for their review would be useful. This is undoubtedly a Foundation-wide issue.

III. Quality of the Program and Workload issues

In general, we found that the program officers were doing a great job in dealing with the mail reviewing process. They used good judgment and consulted one another regularly about borderline proposals. Our analysis of the results of their work suggests that they have indeed done well. They were particularly good at recognizing innovative proposals as well as high quality, high-risk proposals, especially in emerging areas. Specifically, we found the written review analyses done by the program officers to be excellent. Communicating a redacted written form of these to proposal writers might be considered in addition to the usual verbal communication. There was a strong sense that the letter grades were of less utility than the written reviews, and that the program officers understood how to interpret both. Another strong suit of the present program officers is their ability to interface well with other divisions in NSF and with other agencies. In sum, the program officers are doing a fine job under difficult circumstances. They have a significant amount of discretion and they use it well.

When panels were routinely used for some programs, the written panel reviews were unevenly done. Some panels were better than others at providing a written rationale for their recommendations. It may also be useful to include a summary of the panel discussion that led to their decision. This will be valuable to the program officer in making final decisions in borderline cases. In some cases when a program was short-handed, panel reviews were instituted for single investigator proposals.

Although this is a sensible step, care must be taken because it can change the dynamics within the subdivision and cause some anxiety among the proposal writers. It would be useful for the PI to know what review process will be used before submission. This is a case in which the staffing problems have caused difficult choices for the program officers.

As we said earlier, the workload of the division is huge. In addition, the introduction of the window of submission from July to January has had the unanticipated consequence that most of the proposals arrive at the NSF at the end of December. This has caused an enormous change in the annual work schedule of the program officers. Introduction of new initiatives (NANO, ITR and BE) also increases the workload. The chemistry division staff is handling this well at present, but the division ought to think about the balance of permanent to rotating program officers or adding a second submission deadline. Rotators take some time to get up to speed, thus more permanent program officers (relative to rotating) may be more useful for dealing with the increased workload and maintaining institutional memory.

The community values the program officers highly and knows them to be knowledgeable and up-to-date in their scientific expertise. With their workload, it is difficult to see how they manage this at the present time, but we were pleased to see that they do. We are concerned that with the increasing number of proposals, they will eventually fall behind. We believe that increasing the number of program officers (either by adding to the staff or by reorganizing the ratio of support staff to administrative staff) is imperative.

A number of people commented on the possibility of increasing the length of time of a typical grant from 3 to 4 or 5 years. This would make life easier for the PIs, and decrease the number of proposal decisions in a given year, thereby helping the workload issue. In the steady state, this will lead to fewer grants being made (although the number of investigators could remain the same). A possible additional strategy is to increase the number of creativity renewals (CREX) given every year. We suggest that analysis of the second year annual report could be used to effect this change. Aside from the positive influence it will have on the PIs involved, it could also improve the quality of the annual reports if the community knows there is a possibility for a renewal without a formally (outside) reviewed proposal.

Another issue that arose in our discussions is the use of intelligent database systems to provide help to the program officers with their reviewer choices. We were surprised, for example, to discover that NSF does not have access to databases such as SciFinder. The major journals in the field of chemistry have such intelligent systems; thus, the expertise exists in the community. We suggest that this be implemented, at least as an experiment, in order to make this process more efficient. Implementation of these suggestions would require more technical

expertise among the staff. With the coming introduction of electronic jackets, we believe this need will increase.

IV. Division Balance, Priorities

The COV examined six program areas. The proposals in all these areas were strong and the distribution over the traditional sub-areas of chemistry was considered to be good. There is no obvious imbalance in the program of the Division. The program officers are cognizant of the many proposals that are at the boundaries of traditional chemical disciplines and act with eminent common sense to ensure that the best proposals are funded. However, many excellent proposals were unable to be funded due to budgetary constraints; these are also distributed throughout the program.

The Division supports an integrated program of research and education. The last COV supported this position and we wholeheartedly agree. As already noted, the importance of the broader impact of research proposals has been communicated to the community and it is responding. The Division should continue to educate the community in this area.

There is always a trade-off between individual investigator grants and other type grants. We believe that the present mix (70% individual investigator) is near optimal. The average size of a single investigator grant has gone up in the last three years by about 4-5% and by 12% in the last six years. There was some feeling that this was barely keeping up with inflation or with the increasing stipends for students. Without increases in core budgets, the only way to increase the size of single investigator awards is to reduce the success rate and make fewer awards. Since the division is already turning down exceptional proposals due to budgetary constraints, this would be an unpalatable solution.

Chemistry research is changing rapidly and there is a need to fund the best new ideas. We believe that the individual program officers should continue and perhaps increase the number of high risk, high payoff grants like SGER awards. These are small, but can be given quickly and efficiently.

The COV looked at the CAREER awards (several of the members of the COV had been awardees), and concluded that these are important and should be continued. However, it appears that this is now almost the only way to fund young investigators. Many young investigators who are preparing to submit a CAREER proposal have little experience in teaching. There should be a mechanism for mentoring them in how to put together a persuasive education section.

We were also pleased with the support of high quality research at predominantly undergraduate institutions. The number of investigators at undergraduate institutions was about 100 over the last three years.

V. Quality and Significance of the Results of Division's Investments

Chemistry is often described as the "central science". Advances in chemistry have changed the way that scientists of a number of disciplines do their work, from biology to materials science. This has been especially true in the last few years. Examples in nanoscience and biology abound. The Chemistry Division of the NSF has funded much of this innovative work.

There is no doubt that the return on the investments of the Division has been exceptionally good. The NSF supports the training of many of the graduate and undergraduate students in chemistry laboratories throughout the US. These young men and women then go into many of the most profitable economic sectors in the country (e.g. the chemical, electronic and pharmaceutical industries). In addition, many of the staff members of chemistry and other departments in national laboratories and academic institutions had NSF support when they were educated and trained. Manpower in chemistry and related areas nation-wide has been strongly affected by the NSF chemistry division. Indeed, the need for well-trained chemists continues to rise ["Strong demand is expected for chemists with a master's or Ph.D. degree. " quoted from Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2002-03 Edition, Chemists and Materials Scientists, on the Internet at http://www.bls.gov/oco/ocos049.htm]. The Division can play a major positive role in meeting this need, if the budget allows.

The NSF Chemistry Division has funded much of the major breakthroughs in chemistry over its history and this continues today. These have led to Nobel prizes as well as changing the way the chemical and pharmaceutical industries do their jobs. New chemical instrumentation and new computational paradigms that have largely come from the single investigator programs have been increasingly important in this regard.

The increasing disparity between the average size and duration of individual investigator awards from the NIH and NSF is of serious concern. This disparity is driving excellent science out of the NSF portfolio. In addition, some panelists felt that federally funded chemists are increasingly redirecting their research towards medically related areas. If this is correct, critical areas of national need (*e.g.*, chemical and biological sensors, instrumentation), scientific infrastructure and workforce training will be underserved.

The Division supports chemical instrumentation and equipment in a number of ways. The Chemistry Research Instrumentation and Facilities program (CRIF) and individual investigator grants support state of the art instruments. The Division continues to support a beam line (with DoE) at the APS as well as the high field FT-ICR/MS facility at the High Magnetic

Field Laboratory at FSU In addition, the Division continues to participate in the NSF-wide MRI program that brings additional funding for shared instrumentation in chemistry. The total CRIF/MRI programs in chemistry amounted to over $18M in FY2003.

VI. Support of the NSF's Strategic Plan

The Chemistry Division is a success story: it supports a diverse, internationally competitive workforce of scientists, engineers and well-prepared citizens. The chemistry division has participated and supported the National Academy of Sciences study of chemistry and chemical engineering research called "Challenge for the Chemical Sciences in the 21st Century" that resulted in the report entitled "Beyond the Molecular Frontier" that identifies key opportunities and challenges in the chemical sciences. Six companion reports have been developed on the issues of materials and manufacturing, energy and transportation, national security and homeland defense, health and medicine, computing and communications, and environment.

The Division supported approximately 1600 graduate students and 600 postdoctoral students in FY 2003. These numbers are up since the last COV report and are close to the historic maximum. Diversity is still problematic for chemistry as for many of the sciences. At least half the undergraduate chemistry majors are women; about 34% of the Ph.D. s in chemistry in 2002 were awarded to women. The last report on women faculty at "top 50" chemistry departments (with respect to research expenditures) shows that 12% of the faculty were women (C&EN News, Oct. 27, 2003, p. 58). In FY 2003, 16% of the NSF principal and co-principal investigators were women. About 4.5 % of the Ph.D.s in chemistry in 2002 were awarded to underrepresented minorities. In FY 2003, 5% of the PIs and co-PIs funded by the chemistry division are underrepresented minorities. Thus, the Chemistry Division supports underrepresented faculty well. The challenge for the community is to increase their representation at research universities. The NSF-ADVANCE program aims at changing the climate at universities and advancing the careers of women faculty.

The Division is an active participant in the REU program. About half the undergraduates are female and more than 20% are underrepresented minorities. In addition the RUI and PUI programs supporting research activities in predominantly undergraduate institutions are important parts of the overall Chemistry program. We believe that the Division supports undergraduate research very well in a variety of programs.

NSF-chemistry funded investigators have received four recent Nobel prizes: (Fenn, 2002, Sharpless, 2001, MacDiarmid, 2000, and Zewail, 1999)

VII. The Future

Chemistry already has close collaborations with other divisions at NSF and will continue to in the future. The Chemistry division should partner with other agencies and the chemical community to advance a number of new initiatives and proposals. For example, chemical computation has become ubiquitous throughout the world of chemistry including in the chemical and pharmaceutical industries. In the future, more and more accurate and difficult computations will become possible. We should now be thinking of ways to bring this strength to every desktop by using the internet.

We urge the chemistry division to energize the community to take part in the nascent NSF programs in cyber-technology. Use of grid techniques for large-scale computations will be common in the next decade. Chemistry ought to be a major player in this effort because of the strengths of the community in molecular level computation. One simple vision is to be able to do protein-ligand interactions or protein folding on a laptop at home or in the undergraduate classroom via the internet. It is possible now. It will change the way we do science and the way we teach undergraduate and graduate students.

Taking part in the cyber technology program would also connect with the strength of the community in the visualization of science. This is another place where individual investigators have made great advances that should be made more routinely available for researchers and teachers. The Division could act as a catalyst for innovative advances in this area.

The emerging area of the basic molecular understanding of living processes, such as how cellular biochemical reaction networks function at the molecular level, is another place where chemistry and other divisions can partner, and provide a launching pad for the community. The new NIH roadmap proposes such initiatives as new tools to describe the dynamics of protein interactions, vastly increasing the sensitivity of tools for imaging, and creating databases of bioactivity of small molecules. It should be noted that all of these goals are only made possible through recent advances in chemistry (ultra-fast spectroscopy, single molecule detection, high throughput screening methods, etc.). If our national science and technology strategy is to support the goal of such revolutionary advances, it must be fed by accelerating advances in chemistry, and NSF is the logical home of such activities. NSF could make a bold statement about their role in this enterprise by emphasizing their support for the chemical sciences.

The new mid-range instrumentation initiative (for $2M-$100M proposals) is an opportunity for the chemistry community. The NSF Chemistry Division should take a lead in organizing workshops and the like to enable the chemical community to take the best advantage of this

new scientific opportunity. Such activities will need to consider carefully both the types of major instrumentation required by chemists and the modes for obtaining broad utilization of, and support for, this instrumentation.

Finally, there is a concern that the essential and enabling role that chemistry plays in related fields and in meeting public needs often goes unnoticed. The community as a whole needs to do a better job in selling chemistry both to attract the next generation of chemists and to reinforce the fact that an increased investment in basic research in chemistry is in the public interest

Appendix A : list of COV members,

Committee of Visitors Mailing List

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Appendix B

Agenda

Division of Chemistry 2004 Committee of Visitors

Tuesday, February 3

Conference Room 375

8:00 am	Continental Break (Conference Room 375)
8:30 am	Charge to the Committee of Visitors Judith Sunley Executive Officer, Mathematical and Physical Sciences
8:45 am	Conflict of Interest Briefing Fae Korsmo Staff Associate, Office of Integrative Activities
9:00 am	Overview of Division Arthur Ellis Division Director, Chemistry Division
9:45 am	General Procedures Donald Burland Executive Officer, Division of Chemistry
10:00 am	First Round In-depth Program Review (See Assignments for room locations)
11:45 am	Working Lunch (Pick up lunch in Room 375)
5:00 pm	Adjourn
5:30 p.m.	Reception (Conference Room 375)
6:30 p.m.	Dinner in small groups with NSF staff members

Wednesday, February 4

8:00 am	Continental Break (Conference Room 375)
8:30 am	Preparation of First Round Report
10:30 am	Second Round Program Review (See Assignments for room locations)
11:45 am	Working Lunch (Pick up lunch in Room 375)
3:30pm	Afternoon Refreshment (Conference Room 375)
4:00pm	Preparation of Second Round Report
6:00pm	Adjourn

Thursday, February 5

8:00am	Continental Break (Conference Room 375)
8:30 am	Merge 1st and 2nd Round Reports
10:00am	Open Discussion of Divisional Issues (Conference Room 375)
12:00	Working Lunch (Pick up lunch in Room 375)
1:00pm	Briefing of Judith Sunley by COV
3:00pm	Adjourn

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Appendix C: Review Assignments
Bob Silbey, At Large

First Session: Tuesday, February 3, 2004

ASC Room 340	CRIF/NANO/ITR Room 365	IBO Room 370	OMC Room 380	PCHEM Room 390	SPO/Edu/Collab Room 375
Kennedy	***Ichiye***	***Bowman-James***	***Wipf***	***Reisler***	***Bonner***
Brodbelt	Armstrong-Poston	Burns	Lineberger	Goodson	Banfield
Edmiston	Chu	Gladfelter	Kaifer	Kong	Fowler
Hines	Holmgren	Stang	Brookhart	Martinez	Hollinsed
	Lazzaroni	Stewart	Byers	Sinnott	Stevens

Second Session: Wednesday, February 4, 2004

ASC Room 340	CRIF/NANO/ITR Room 365	IBO Room 370	OMC Room 380	PCHEM Room 390	SPO/Edu/Collab Room 375
Chu	***Gladfelter***	***Holmgren***	***Stang***	***Hines***	***Byers***
Banfield	Edmiston	Bonner	Bowman-James	Burns	Brodbelt
Kaifer	Kennedy	Brookhart	Fowler	Stevens	Martinez
Kong	Lineberger	Lazzaroni	Goodson	Armstrong-Poston	Stewart
Wipf	Reisler	Sinnott	Hollinsed	Ichiye	

Merge Session: Thursday, February 5, 2004

ASC Room 340	CRIF/NANO/ITR Room 365	IBO Room 370	OMC Room 380	PCHEM Room 390	SPO/Edu/Collab Room 375
Kennedy	***Ichiye***	*Bowman-James*	***Wipf***	***Reisler***	***Bonner***
Chu	Gladfelter	Holmgren	Stang	Hines	Byers
Brodbelt	Armstrong-Poston	Stewart	Lineberger	Goodson	Banfield
Kaifer	Lazzaroni	Sinnott	Brookhart	Kong	Stevens
	Edmiston	Burns	Hollinsed	Martinez	Fowler

Appendix D. the final merged reports

FY 2004 REPORT TEMPLATE FOR NSF COMMITTEES OF VISITORS (COVs)

Date of COV February 3 – 5, 2004
Program/Cluster: Chemistry Education & Chemistry Collaboratives
Division: Chemistry
Directorate: Mathematical and Physical Sciences
Number of actions reviewed by COV[1]: Awards: 12 Declinations: 9 Other: 0
Total number of actions within Program/Cluster/Division during period being reviewed by COV[2]: 383 Awards: 82 Declinations: 299 Other: 2
Manner in which reviewed actions were selected: initial jackets were selected by the Program Officers, additional jackets were requested by the COV.

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. Please do not take time to answer questions if they do not apply to the program.

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

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE

[1] To be provided by NSF staff.
[2] To be provided by NSF staff.

Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) Comments: Yes; the continued use of more than 3 reviewers on large interdisciplinary proposals is necessary to do justice to the breadth of the science; the panel summary needs to have more detail to reflect how the panel ranking was made; other points: the signed ad hoc reviews are useful to counteract a dominant panelist; the mid point site visit was considered valuable.	yes
Is the review process efficient and effective? Comments: Efficiency exceeds NSF internal standard; Effectiveness is in question because there are too many outstanding proposals and too little funds. This is more evident in these programs than in single-investigator programs because the available funds are small. Furthermore, there is not a long track record to establish the character of the programs.	yes
Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines? Comments: There was significant variability in this regard by program. REU and RSEC proposals were very strong regarding "criteria 2". Collaborative research proposals were weaker in this regard, but we did note that the funded proposals did tend to have marginally stronger components addressing broader impact. Reviewers are not providing feedback on the broader impact criteria; suggest that reviewers discuss "missed opportunities" and that there be reminders to comment on broader impact in the reviewer's letter.	varies
Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer's recommendation? Comments: Usually	Yes

Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments: No; in general they were cut and paste from the reviews; in some cases they didn't give a rationale for the overall ranking and recommendation process; summaries need to describe how the decision was made; suggest a check-off list to hit each important point; in summary need more meat for the panel summary and a structured summary with cues to assure that all criteria are addressed. There are enough good proposals on the borderline that it is often difficult to discern rationale for declination of funding. Panel summaries do not always fully convey the discussions which occurred during the panel.	No
Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: Yes. The panel commends the program officers for the care that they take in providing detailed descriptions of the decision process, particularly in borderline cases.	yes
Is the time to decision appropriate? Comments: yes but we recognize that some of the complex proposals may take longer than 6 months and that is okay.	Yes
Discuss issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures: It is very important that collaborative proposals continue to be reviewed including the use of panels. The combined use of ad hoc and panel reviewers is deemed very useful for the CRC program. It should be clear what combination of ad hoc and panel reviews will be used for a particular program. It is not currently clear in the solicitations for REU and CRC programs.	

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers. Provide comments in the space below the question. Discuss issues or concerns in the space provided.

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Have the individual reviews (either mail or panel) addressed whether the proposal contributes to both merit review criteria? Comments: In general, no; Some reviewers did not take the "broader impact" criteria seriously; in general it is given short shrift; if NSF requires that broader impact be addressed then it must give the PI feedback on this criteria; suggest to modify the letter where broader impact is discussed to make it stronger. Standards for broader impacts contributions are not broadly agreed upon within the community of reviewers.	Mixed
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria? Comments: generally, no because the panel summaries are generally a compilation of the reviewers report. Panels offer an opportunity for NSF to educate panelists on the importance of criteria 2.	No
Have the *review analyses* (Form 7s) addressed whether the proposal contributes to both merit review criteria? Comments: For these programs (REU, CRC, etc.) that are reviewed by panel, the review analysis is a more detailed account of the panel summary.	No

Discuss any issues or concerns the COV has identified with respect to NSF's merit review system.

A.3 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
Did the program make use of an adequate number of reviewers for a balanced review? Comments: A concern was expressed about large multi-disciplinary proposals at the funding margin and the need for program staff to carefully consider whether additional reviews would be beneficial; in general it was felt that the process is thoughtful.	Yes
Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: Program monitors take great pains to get a sample which includes experts in all applicable areas for collaborative proposals. It should be recognized that this is a difficult task and increases workload.	yes
Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: balance was excellent	yes

Did the program recognize and resolve conflicts of interest when appropriate? Comments: Some are discovered during the review process, but program monitors are diligent in avoiding COIs or resolving them promptly.	Yes
Discuss any concerns identified that are relevant to selection of reviewers.	

A.4 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.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
Overall quality of the research and/or education projects supported by the program. Comments: Excellent quality for REU. Other programs are too new to judge.	NA
Are awards appropriate in size and duration for the scope of the projects? Comments: For the CRC program, the range in award sizes encourages flexibility, which is important to an experimental program of this type. For EMSI/CRAEMS and REU, the award size and duration seems consistent with programmatic aims. Large collaborative projects require 5 year terms in order to nurture the project and lead to good results.	NA
Does the program portfolio have an appropriate balance of: • High Risk Proposals? Comments: CRC proposals tend to be big and multi-faceted rather than truly risky science, but an element of risk arises from their collaborative nature. There have been several high-risk proposals funded in the context of undergraduate education (REU and RSEC), with mixed results.	yes
Does the program portfolio have an appropriate balance of: • Multidisciplinary Proposals? Comments: Yes; for the REU's it is the opportunity that is important; it was felt that the program was providing a variety of experiences; comment: there is no model of a perfect REU.	yes

Does the program portfolio have an appropriate balance of: • Innovative Proposals? Comments: Innovation is one of the main criteria reviewers use though some were poorly written	yes
Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals? Comments: NA	NA
Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments: The nature of the program for CRC and EMSI (i.e. large awards) does not encourage new investigators as PIs, though inclusion of support for new investigators via the CRC and EMSI team is highly encouraged.	NA
Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments: yes for REU's, data not available for other programs	yes
Does the program portfolio have an appropriate balance of: • Institutional types? Comments: REUs have very good distribution across institution types, while other programs (CRC/CRAEMS/EMSI) have little representation outside major research universities. It may be worthwhile to add a sentence to the solicitation for CRC: "Collaborations involving investigators at undergraduate institutions are encouraged."	yes

Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments: Yes; the efforts to get broad coverage is commendable though some states could use an REU; suggest program to look at demographics and consider strategies in mentoring on grantsmanship for institutions from these regions without REU's. EMSI and CRAEMS do not always pursue educational outreach to the extent one expects from large centers.	yes
Does the program portfolio have an appropriate balance: • Across disciplines and subdisciplines of the activity and of emerging opportunities? Comments:	NA
Does the program portfolio have appropriate participation of underrepresented groups? Comments: Yes; the diversity of students is commendable; There was no data on the diversity of the faculty. The Hispanic percent is lower than the population at large. There are probably multiple contributing factors.	yes
Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. Comments: REU and RSEC are clearly directly relevant to strengthening the scientific workforce. EMSI and CRAEMS are directly relevant to broad environmental concerns.	yes
Discuss any concerns identified that are relevant to the quality of the projects or the balance of the portfolio.	

A.5 Management of the program under review. Please comment on:

Management of the program. Comments: This is a new program and the COV commends the staff on their management of this diverse portfolio. A striking example of quick and appropriate response in a failed RSEC site was presented. Staff has been paying careful attention to details including overlap and conflicts of interest. The COV notes the importance of these collaborative programs for driving research at the boundaries and the pride and enthusiasm of the staff in their stewardship of the portfolio. There are some suggestions. In some cases the panel summaries need to better describe the dynamics of the review; what factors underlie the recommendation? Annual reporting requirements should require the PI to provide documentation on progress in all program elements. For example, PI's should clearly document which publications involve students and collaborators (is this a group which works together?). There are tools that could be used to capture this information to document that the proposal fosters collaboration and training and that the whole is greater than the sum of the parts. The COV commends the short dwell time but they also recognize that it is okay if some of the proposals take longer than 6 months because of their complexity.
Responsiveness of the program to emerging research and education trends. Comments: Funded REU proposals in particular reflect a "whole-person" approach to undergraduate education, in accord with recent educational theories. The CRAEMS/EMSI programs reflect research trends in emerging areas of environmental science.
Program planning and prioritization process (internal and external) that guided the development of the portfolio under review. Comments: Many of these programs are inherently experimental and program identities are still being formed. The REU program is well-established and has a well-agreed upon identity.

Discuss any concerns identified that are relevant to the management of the program.
Site visits are very important to the appropriate shepherding of these multidisciplinary and/or undergraduate outreach programs. It is essential that sufficient staffing and travel funding is available to allow this to be carried out regularly.

PART B. RESULTS : OUTPUTS AND OUTCOMES OF NSF INVESTMENTS

NSF investments produce results that appear over time. The answers to the first three (People, Ideas and Tools) questions in this section are to be based on the COV's study of award results, which are direct and indirect accomplishments of projects supported by the program. These projects may be currently active or closed out during the previous three fiscal years. The COV review may also 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. Incremental progress made on results reported in prior fiscal years may also be considered.

The following questions are developed using the NSF outcome goals in the NSF Strategic Plan. The COV should look carefully at and comment on (1) noteworthy achievements of the year based on NSF awards; (2) the ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcomes; and (3) expectations for future performance based on the current set of awards. NSF asks the COV to provide comments on the degree to which past investments in research and education have contributed to NSF's progress towards its annual strategic outcome goals and to its mission:

- To promote the progress of science.
- To advance national health, prosperity, and welfare.
- To secure the national defense.
- And for other purposes.

Excellence in managing NSF underpins all of the agency's activities. For the response to the Outcome Goal for Organizational Excellence, the COV should comment, where appropriate, on NSF providing an agile, innovative organization. Critical indicators in this area include (1) operation of a credible, efficient merit review system; (2) utilizing and sustaining broad access to new and emerging technologies for business application; (3) developing a diverse, capable, motivated staff that operates with efficiency and integrity; and (4) developing and using performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

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

B.1 OUTCOME GOAL for PEOPLE: Developing "a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens."

These programs highlight collaboration and thus contribute in a special way to the education of present and future scientists as the team approach becomes more important. Furthermore, the REU program provides an effective way to increase diversity in the sciences. For example, the REU at U. South Dakota (CHE-0138961) targets Native American and other underrepresented groups for undergraduate research.

B.2 OUTCOME GOAL for IDEAS: Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."

Comments: Collaborative proposals are a very positive thing for the Division and teaming is an excellent mechanism for solving science problems. The COV cites the CREAMS proposal as an excellent example: CHE 0089136 "Fundamental Studies in nanoparticle formation in air pollution." B. Wyslouzil, PI.

On the education side, the University of Santa Clara (CHE-0139527) – REU with ethics component Center for Applied Ethics.

B.3 OUTCOME GOAL for TOOLS: Providing "broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation."

For the collaboratives, this is covered in instrumentation to support the research projects. For education, an example of a tool that increases access to chemical instrumentation is the Mobile chemistry lab Virginia Polytechnic Institute (CHE-0111501).

B.4 OUTCOME GOAL for ORGANIZATIONAL EXCELLENCE: Providing "an agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices."

The large influx of proposals for the URC program suggests that this reformulation of the RSEC program resonates particularly well with the scientific community. This could turn out to be a success story for the experimental nature of the special programs such as RSEC and URC.

We commend the program on implementation of electronic program management.

PART C. OTHER TOPICS

C.1 Please comment on any program areas in need of improvement or gaps (if any) within program areas.
These programs (CRC/EMSI/CRAEMS) are inherently experimental and intended to fill the gaps in the overall program.

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.
Because they are experimental, these programs (CRC/EMSI/CRAEMS) need to be monitored closely and solicitations need to be flexible.

C.3 Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.
Considerable progress in the understanding of broader impacts criteria by both reviewers and proposers is evident (largely due to the "Dear Colleague" letter), but we feel that further effort to educate the community on how these should be addressed is appropriate.

C.4 Please provide comments on any other issues the COV feels are relevant.
The agency should elevate the visibility of the outcomes from the "broader impact" criteria.

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

The COV found jackets of proposals at the margin to be especially useful in preparing their evaluations and suggests that more of these examples be provided at the outset in future reviews.

It is a lot of work to review both collaborative and education programs and we suggest that these be separated in the next COV.

SIGNATURE BLOCK:

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For the COV: Chemistry Education & Chemistry Collaboratives
Carl Bonner
Chair

FY 2004 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

Date of COV: Feb. 2-5, 2004
Program/Cluster: Physical Chemistry
Division: Chemistry
Directorate: MPS
Number of actions reviewed by COV[3]: Awards: 16 Declinations: 14 Other:
Total number of actions within Program/Cluster/Division during period being reviewed by COV[4]: Awards: 272 Declinations: 388 Other:
Manner in which reviewed actions were selected: Divisional Guidelines

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. Please do not take time to answer questions if they do not apply to the program.

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

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE

[3] To be provided by NSF staff.
[4] To be provided by NSF staff.

Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) Comments: Mostly ad hoc reviews for single investigators, panels of CAREER. Proposer needs to know before submission which one to expect. It is nice that the program officers have a number of different mechanisms available for program evaluation. In cases where the division was understaffed, the ability to convene panels was crucial. The use of panel reviews in addition to individual *ad hoc* reviews generated a significant amount of discussion. On the positive side, some COV members thought that panels provided a broader perspective. On the other hand, some members were concerned by the depth and quality of panel reviews.	Yes
Is the review process efficient and effective? Comments: Efficiency depends on available manpower. EPC is not up to the division's rate of 6 month processing. Review process is effective	Mostly yes
Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines? Comments: Some reviews address both criteria, but some still do not. Some reviewers deliberately ignore the "broader impact" criterion. As with other areas of science, there is some question about the broader impacts criterion. Some members of the panel noted that physical chemistry takes the broader impacts criterion more seriously than other divisions. The division is commended for this.	Many do
Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer's recommendation? Comments: Mostly yes. Most reviews have constructive criticisms. Some, however, are too short and vague. In cases where superficial reviews were obtained, the program officers were proactive in soliciting additional reviews.	Yes
Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments:	Yes

They are generally quite specific on the main reasons for funding/declination. It is very useful that both individual and summary reviews are sent to the PI, as done in Physical Chemistry.	
Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: Yes. Program officer not only summarizes but also evaluates the reviews, and exercise judgment when the reviews are conflicting. The panel notes the information in these reviews would be useful for PIs, especially in the case where the proposal is declined. The division should consider making these analyses available to the Pis, and then complement them with a phone conversation.	Yes
Is the time to decision appropriate? Comments: Once all the reviews are in, decisions are moslty being made in a timely fashion. Given the severe staffing issues, the Physical Chemistry division has done as well as could be expected. Nevertheless, it is also clear that the time to decision has suffered due to staffing issues. Also, panels were convened to shorten time to decision.	Mostly yes

Discuss issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures:
Reviewers realize that E/V ratio determine funding decisions. However, they do not always realize that if the contents of the review conflicts with the summary rating, the contents is what is used in the final review decisions. Is the rating system effective? It has become almost a pass/fail system. More explicit guidance to reviewers will be helpful.
There are many examples where the program officer was forced to "renormalize" the letter scores so that they would be consistent with the written comments. Although the panel was supportive of the ultimate funding decisions made by the program officers, there are a number of cases where the funding decisions were at odds with the letter grades (*e.g.,* proposals with 5 E's where funding was declined.) In at least one case, this discrepancy led to significant misunderstanding by the PI. The letter grades do not appear to serve a purpose, and the panel recommends that their existence be seriously re-evaluated. Other funding agencies, such as the DOE, have abolished scores for the reasons outlined above. A better summary section may do the job.

The panel finds that the combination of ad hoc reviews, panel summaries (when a panel is convened), written program officer summary, and a phone conversation with the PI are all needed to convey information constructively to the PI about the fate of their proposal.

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers. Provide comments in the space below the question. Discuss issues or concerns in the space provided.

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Have the individual reviews (either mail or panel) addressed whether the proposal contributes to both merit review criteria? Comments: Mostly yes	Mostly yes
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria? Comments: Yes, most panels are well instructed on what is expected of them.	Mostly yes
Have the *review analyses* (Form 7s) addressed whether the proposal contributes to both merit review criteria? Comments: Both criteria are mentioned in the review analyses.	Yes

Discuss any issues or concerns the COV has identified with respect to NSF's merit review system.
There is still some confusion regarding the importance of the Broader Impact criterion on funding decisions. This is treated differently by different reviewers. Better guidance to reviewers should be given.

A.3 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
Did the program make use of an adequate number of reviewers for a balanced review? Comments: Too many reviewers do not respond on time, and do not decline to review in a timely manner. The division was very proactive in soliciting additional reviews when the initial set of reviews provided insufficient information for a reasoned decision, The division is commended on this practice.	Yes
Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: Yes. When the program officer discovers that a reviewer is not suitable, this review is discounted.	Yes
Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: Most appear to be diverse in all respects. The use of the checklist in selecting reviewers is an excellent mechanism to insure breadth of the panel in many different ways. The division is commended on this process.	Yes

Did the program recognize and resolve conflicts of interest when appropriate? Comments: Some are discovered during the review process, but mostly these are avoided.	Yes
Discuss any concerns identified that are relevant to selection of reviewers. Selection of the reviewers is one of the most crucial aspects of the review process, especially since there is very little chance for rebuttal before decision is made. The current program officers have developed good criteria and a broad base of reviewers. Very few problems are related to a bad choice of reviewers.	

A.4 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.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
Overall quality of the research and/or education projects supported by the program. Comments: Excellent quality. Best investigators in the US are funded by NSF, and they choose to submit their best ideas to NSF (anecdotal). The only limitation is the available funding.	Appropriate
Are awards appropriate in size and duration for the scope of the projects? Comments: 1. It is desirable to have more long term awards to allow PIs to fully develop their ideas before they feel compelled to move to something else in the next proposal. More > 3 year proposals should be awarded to PIs with good track record. Longer awards will save time to program officers and reduce pressure on reviewers. Both the PI and program officers will benefit from such flexibility. The panel recognizes the hard choices that are forced upon the program officers by their very limited budgets. From a scientific standpoint, it is clear that an increased size and duration of the awards would be beneficial. Nevertheless, the NSF must deal with the reality of the current funding situation. Given this constraint, the current size and duration are perhaps the best compromise. NSF needs to increase the total amount of money coming to Chemistry in order to enable this flexibility and yet address emerging opportunities.	Appropriate
Does the program portfolio have an appropriate balance of: • High Risk Proposals? Comments: High risk proposals are funded but no detailed statistics are available.	No sufficient data to evaluate

Does the program portfolio have an appropriate balance of: • Multidisciplinary Proposals? Comments:	Appropriate
Does the program portfolio have an appropriate balance of: • Innovative Proposals? Comments: Innovation is one of the main criteria used. Proposals that were perceived to be evolutionary were not, in general, funded, even if they were submitted by PIs with strong track records.	Appropriate
Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals? Comments: Physical chemistry funds almost exclusively single investigator grants. Other programs deal with group awards.	Appropriate
Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments: CAREER seems to be the preferred avenue for young PI's. Anecdotally, young investigators seem to be funded at rate that is comparable to the rate for all new proposals. The panel notes that we were not given sufficient information to evaluate this question completely.	Appropriate
Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments: Looking at the compilation of awards reveals a geographical balanced.	Appropriate
Does the program portfolio have an appropriate balance of: • Institutional types? Comments: No comment	Appropriate

Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments: Yes, the review criteria demand this.	Appropriate
Does the program portfolio have an appropriate balance: ▪ Across disciplines and subdisciplines of the activity and of emerging opportunities? Comments: Some panel members were concerned that the portfolio was more conservative than would be optimal, but most felt the balance was fine.	Appropriate
Does the program portfolio have appropriate participation of underrepresented groups? Comments: In borderline cases underrepresented status can tip the balance.	Appropriate
Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. Comments: No comment	Appropriate
Discuss any concerns identified that are relevant to the quality of the projects or the balance of the portfolio.	

A.5 Management of the program under review. Please comment on:

Management of the program. Comments: Program appears to be very well managed. Management is appropriate for the level of staffing that is available. More full-time staff would benefit this program. The physical division has established excellent procedures for insuring that even tough proposals receive an appropriate evaluation.
Responsiveness of the program to emerging research and education trends. Comments: The new division head is very dedicated to addressing emerging needs and trends. New workshops and initiatives are in various stages of development. There are some examples to responsiveness to emerging research needs, however the division of sub-disciplines may limit the division's ability to respond to new and emerging research.
Program planning and prioritization process (internal and external) that guided the development of the portfolio under review. Comments: Although the program planning may be appropriate, we were not given any information about this process.
Discuss any concerns identified that are relevant to the management of the program. 1. Despite improvement in comparison to previous years, there are still problems related to discontinuity and turnover of stuff that occasionally prevents the program from meeting the division's goal of 6-month response time. The program officers do the best they can, without compromising the review process. Also, frequent turnover results in loss of institutional memory, which is regrettable. Hopefully a permanent program officer in the experimental program will be found soon.

PART B. RESULTS : OUTPUTS AND OUTCOMES OF NSF INVESTMENTS

NSF investments produce results that appear over time. The answers to the first three (People, Ideas and Tools) questions in this section are to be based on the COV's study of award results, which are direct and indirect accomplishments of projects supported by the program. These projects may be currently active or closed out during the previous three fiscal years. The COV review may also 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. Incremental progress made on results reported in prior fiscal years may also be considered.

The following questions are developed using the NSF outcome goals in the NSF Strategic Plan. The COV should look carefully at and comment on (1) noteworthy achievements of the year based on NSF awards; (2) the ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcomes; and (3) expectations for future performance based on the current set of awards. NSF asks the COV to provide comments on the degree to which past investments in research and education have contributed to NSF's progress towards its annual strategic outcome goals and to its mission:

- To promote the progress of science.
- To advance national health, prosperity, and welfare.
- To secure the national defense.
- And for other purposes.

Excellence in managing NSF underpins all of the agency's activities. For the response to the Outcome Goal for Organizational Excellence, the COV should comment, where appropriate, on NSF providing an agile, innovative organization. Critical indicators in this area include (1) operation of a credible, efficient merit review system; (2) utilizing and sustaining broad access to new and emerging technologies for business application; (3) developing a diverse, capable, motivated staff that operates with efficiency and integrity; and (4) developing and using performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

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

B.1 OUTCOME GOAL for PEOPLE: Developing "a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens."

Comments: NSF encourages and supports diversity, but it is still a challenge because of societal forces outside NSF.
Graduate student training is an important part of developing the scientific workforce, and the Physical Chemistry program has been developing new methods for this. With recent advances in computational hardware and software, many graduate students in theoretical chemistry receive excellent training in numerical modeling. However, interpreting numerical results and making the connection to experiment requires a solid grounding in analytical techniques such as complex variables, Green's functions, and path integrals. Shaul Mukamel of the University of Rochester and Rudolph Marcus of Caltech have initiated a new two-week "summer school" managed by Gordon Research Conferences (CHE-0075390) to train graduate students and postdoctoral researchers in these vital techniques. While such summer schools are common in Europe, this is the first U.S. workshop of its kind, with plans to continue this activity every other year (CHE-0212942) and with a changing emphasis on the application area. The first workshop, in June, 2000, attracted 77 participants, who were then trained in analytical approaches for the study of rate processes and time-resolved spectroscopy in condensed phases. The organizers have made an effort to attract attendees from underrepresented groups through aggressive advertising and networking. Detailed evaluations at the end of the first summer school were supplied by 47 participants, and their enthusiastic comments of appreciation indicate that this workshop has become a vital component in their graduate education.

B.2 OUTCOME GOAL for IDEAS: Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."

Comments: NSF is doing a great job integrating between different disciplines and between education and research while maintaining innovation. NSF is the main gateway to innovation in basic research among funding agencies.
One example of where the Physical Chemistry Division has had a significant impact is in the emerging area of molecular electronics. In its 12/21/2001 issue, *Science* magazine's Breakthrough of the Year recognized synthetic efforts in making molecular systems that behave as elements of integrated circuit devices. Mark Ratner of Northwestern University (CHE-9812180, "Molecular Wires, Quantum Dynamics and Relaxation") is credited with the first conjecture (in 1974) that molecular systems might be the basis for integrated circuits built from the ground up. Ratner's theoretical work in electron transfer has been supported continuously for over 25 years by the NSF Chemistry Division, and represents a retrospective investment.

B.3 OUTCOME GOAL for TOOLS: Providing "broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation"

Comments: The program supports tools and facilities for individual PI's at an appropriate level. Other needs are met by the instrumentation program. New research tools are developed by the PI's in response to their emerging needs. Many examples are given in the annual reports and in nuggets.

B.4 OUTCOME GOAL for ORGANIZATIONAL EXCELLENCE: Providing "an agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices."

Comments: We are very impressed with what we have seen.
Outstanding improvements have been made in submission of electronic reviews, checklists for planning and documentation of review process, and many more aspects..

PART C. OTHER TOPICS

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

The program appears to be comprehensive.

A general concern is expressed about the disciplinary structure of the chemistry program,. This may affect the ability to fund. Projecting the available budget onto these historical subdivisions may exacerbate the problem and result in lost opportunities to fund truly innovative science. The program officers of the physical chemistry program have actively sought co-funding opportunities as a mechanism to break out of this mold. However, the very interdisciplinary nature of current science requires re-thinking of the discipline concept.

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.

Panels 1+2: No comment

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

Panel 1. Increase staffing. Find ways to decrease workload, which is still staggering. More creativity extensions should be given, and more flexibility in giving > 3 year funding. Develop or acquire a computerized data bases using intelligent algorithms to facilitate selection of reviewers and minimize conflict of interest issues (e.g. past graduate students, postdocs, and spouses).

Panel 2. There is some concern that the staffing level has not increased at the same rate as number of proposals. Although the use of electronic review has helped in this matter, the panel is concerned about this issue.

The panel recommends that an NSF-wide review of proposal letter grades be initiated. Since these letter grades are a part of FastLane, they must be reviewed at an agency-wide level.

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

Panel 1. NSF budget for this program should be increased, so that funding per investigator can be increased and more borderline cases be funded. More flexibility in >3 years funding would also be feasible.

Panel 2. No comment

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

Panel 1. COV meetings are best arranged when most classes are not in session.

Panel 2. There were several questions in the report template where additional statistical information was needed. If the COV is going to be asked these questions, full access to the relevant data is necessary.

Given the limited time available to the COV, the panel questioned whether or not the "nugget mining" necessary to answer the questions in part B was an appropriate use of our time.
It would have been useful to have the complete COV report from previous years.

SIGNATURE BLOCK:

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For the Physical Chemistry COV
Hanna Reisler
Chair

FY 2004 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

Date of COV February 3-5, 2004
Program/Cluster: Analytical Chemistry and Surface Science
Division: Chemistry
Directorate: Mathematical and Physical Sciences
Number of actions reviewed by COV[5]: Awards: 15 Declinations: 15 Other:
Total number of actions within Program/Cluster/Division during period being reviewed by COV[6]: 710 Awards: 196 Declinations: 514 Other:
Manner in which reviewed actions were selected: **According to criteria established by the Division; jackets selected by staff; 6 in addition to those listed above were requested in first round by COV**

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. Please do not take time to answer questions if they do not apply to the program.

A.1 Questions about the quality and effectiveness of the program's use of merit review procedures.

Provide comments in the space below the question. Discuss areas of concern in the space provided.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE

[5] To be provided by NSF staff.
[6] To be provided by NSF staff.

Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) Comments: Use of individual reviewers continues to be a good method of solicitating feedback. In Spring of '03 ASC used a panel to evaluate borderline proposals. This seemed to be an especially effective and appropriate tool and is encouraged. Panels provide different points of view, better adherence to guidelines, and more constructive feedback. Overall, the mechanism is sound.	Yes
Is the review process efficient and effective? Comments: Panels require more time and resources, but are provide additional perspectives and the most balanced reviews. A better rubric and calibration is necessary for E, V, G… ratings especially for individual "mail" reviews. Program officers do a superb job by placing more emphasis on the most substantial written comments and performing post-calibration of E, V, G… ratings. The review process is dictated by the quality of the reviewers. The ASC does very good job identifying reviewers. Overall, the program officers have done an excellent job seeking proper evaluation and using the information obtained to make funding decisions.	Yes
Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines? Comments: For intellectual merit, individual reviews are somewhat spotty; however, every proposal receives at least a few reviews that adequately address this criteria. "Broader impacts" seems to carry less weight in the reviews and the proposals. Often reviewer comments in this area are lacking. Program officers identify broader impacts well, when possible.	Yes
Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer's recommendation? Comments: Approximately 50% of individual reviewers deliver constructive and useful comments. While this appears to be a reasonable success rate in obtaining solid reviews, more instruction to reviewers to return both the strengths and weaknesses of the proposed work may improve the reviews. (see above question as well.)	Yes

Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments: Excellent. Use of panels should be continued or expanded. Panels seem to provide the clearest recommendations. This can be attributed to: (1) having multiple proposals to compare, (2) having reviewers defend decisions to a group, and (3) having other reviewers and program officers to ensure adherence to criteria and guidelines.	Yes
Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: The panel feels that it would be useful to return a written version of Form 7 (Program Officer's Summary) along with reviewers' comments. This would help the PI to better understand the important issues that went into the decision. This procedure is currently employed by the NIH.	Yes
Is the time to decision appropriate? Comments: Often the ASC returns decisions within 6 months despite limited staffing. This time is extremely impressive especially given the workload, complexity of task, and high quality of decisions that are made. Some suggestions for possibly further improving the decision time for proposals, especially those over 6 months, are given in A5.	Yes

Discuss issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures:

1. It may be useful to improve communication of typical review and re-submission procedures to proposal authors. For example, it would be useful to know that of reviewers suggested by a PI, only 2 will typically be chosen. Also, that upon resubmission a sub-set of original reviewers will be used. This type of information can often be gleaned from discussions with a Program Officer; however, it may be useful to include this in the proposal preparation instructions.

2. Choice of reviewers seems appropriate and diverse.

3. The ASC and the NSF in general takes the evaluation procedure very seriously and administers the review process extremely well. Authors should be reassured that the process is careful and fair.

4. The Program Officers are responsibly managing the ASC program.

5. The requirements for reporting results from prior support should be tightened so that it is easier for the reviewers to assess the productivity of the researcher as it pertains to the renewal application. Most troubling was that some PIs use multiple sources of funding for publications yet do not acknowledge this in their proposal.

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers. Provide comments in the space below the question. Discuss issues or concerns in the space provided.

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Have the individual reviews (either mail or panel) addressed whether the proposal contributes to both merit review criteria? Comments: Although both merit review criteria are typically addressed in the individual mail reviews, the comments on the broader impacts typically contain little substance (with the exception of reviews for the CAREER program.) In contrast, panel reviews typically addressed both criteria.	Yes
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria? Comments: Panel summary reviews typically address both criteria; however, it is unclear what effect the broader impact has on acceptance.	Yes
Have the *review analyses* (Form 7s) addressed whether the proposal contributes to both merit review criteria? Comments: In general the Form 7 covers this topic; however, it is often not formally split. It might be useful if the Form 7 included separate sections for both criterion. In addition, it would be useful if the weight of criterion used were discussed.	Yes

Discuss any issues or concerns the COV has identified with respect to NSF's merit review system.

A.3 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
Did the program make use of an adequate number of reviewers for a balanced review? Comments: A large number of reviewers were used meaning that reviewers are not overburdened and a diverse group was chosen.	Yes
Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: Program officers go outside the analytical/surface science community when necessary to find expertise. Some projects are difficult to find a perfect reviewer since some topics are quite interdisciplinary.	Yes
Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: Program makes use of a good cross-section of the scientists in the field of ASC. Scientists from PUIs should be used more often in panels when reviewing proposals from undergraduate institutions (CAREER, etc). However, no systematic problems were observed in the reviewer selections.	Yes
Did the program recognize and resolve conflicts of interest when appropriate? Comments: Several instances were cited and all were handled appropriately.	Yes

Discuss any concerns identified that are relevant to selection of reviewers.

The program officers are given a very limited set of tools to identify reviewers. We sugges an NSF-wide program to improve resources for identifying reviewers in a searchable database. Industrial researchers should be used as an additional and underutilized resource. Literature search engines such as Web of Science or SciFinder should be made available to enable more powerful searches for reviews.

A.4 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.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
Overall quality of the research and/or education projects supported by the program. Comments: In general, the overall quality of the funded proposals was very high. The panel was disconcerted by the number of high quality proposals that had to be declined because of budgetary limitations. It is clear that more high quality science would result if additional funds were available.	appropriate
Are awards appropriate in size and duration for the scope of the projects? Comments: Yes. The panel recognizes the hard choices that are forced upon the program officers by their very limited budgets. On the one hand, the small size of these grants often forces NSF-supported students to teach more than peers supported from other sources (*e.g.,* NIH). The small size and duration of the grants also increase the non-science workload on PI's. These issues are detrimental to science. On the other hand, the NSF must deal with the reality of the current funding situation. Given this constraint, the current size and duration are perhaps the best compromise. Flexibility is enhanced by the fact that the program manager has the capability to further support programs, when needed, through the supplementary funds.	appropriate
Does the program portfolio have an appropriate balance of: • High Risk Proposals? Comments: There are few high risk proposals in this program. In fact, the panel thought that some of the proposals that were labeled "high risk" were relatively risk-free. One possible mechanism for solving this problem is to increase the length of the SGER proposals from 1 to 2 years. A difficulty is that reviewers will often be split on high-risk proposals. Program officers do a good job of weighting these disparate reviews and supporting high-risk projects.	appropriate

Does the program portfolio have an appropriate balance of: • Multidisciplinary Proposals? Comments: This program has a very good track record of funding multidisciplinary proposals and an effort is made to find co-sponsors when appropriate.	appropriate
Does the program portfolio have an appropriate balance of: • Innovative Proposals? Comments: Yes. It is clear that innovation is a major criterion in reviewers' assessments of proposals. Proposals that were simple extensions of previous research received unfavorable outside reviews even if they were submitted by PIs with strong track records. Furthermore, for borderline proposals program officers clearly favored proposals that received high marks for innovation over those where the primary strength was track record.	appropriate
Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals? Comments: Yes. The panel was pleasantly surprised by the relatively high percentage of funds that were awarded to single investigator grants as this type of work is seen as the heart of chemical research.	appropriate
Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments: The relative percentage of new investigator awards seems to be appropriate. The success rate for proposals submitted by new investigators was comparable to the success rate of all new proposals. The feedback to new investigators is very good as evidenced by subsequent funding success.	appropriate
Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments: Yes.	appropriate
Does the program portfolio have an appropriate balance of: • Institutional types? Comments: Yes.	appropriate

Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments: Yes.	appropriate
Does the program portfolio have an appropriate balance: ▲ Across disciplines and subdisciplines of the activity and of emerging opportunities? Comments: In all cases, proposals were evaluated on their scientific merit and innovation, and awards were made on the basis of these reviews. Since innovation and novelty were important criteria in this review, emerging areas were fairly captured by this process. In this time of restricted funding, the panel felt that this was the most appropriate use of limited funds. Earmarking of funds for specific initiatives would likely lead to the funding of less qualified proposals. Workshops are used to help identify new areas of funding.	appropriate
Does the program portfolio have appropriate participation of underrepresented groups? Comments: Yes. Participation by underrepresented groups is consistent with their representation.	appropriate
Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. Comments: Yes. The quick response to national needs resulting from 9/11 is an exemplary example of the program's strong and rapid response to national needs.	appropriate
Discuss any concerns identified that are relevant to the quality of the projects or the balance of the portfolio. No concerns identified.	

A.5 Management of the program under review. Please comment on:

Management of the program.
Comments:

1. Program is very flexible in responding to national priorities and new directions in the field. (see section B.4 for examples.)
2. Recently, program officers used panels to help with making decisions. This should be encouraged.
3. Program officers do an excellent job of finding qualified reviewers and analyzing their responses when making award decisions.
4. The recent establishment of a permanent program manager has greatly improved the management of the program.

Responsiveness of the program to emerging research and education trends.
Comments:
As stated above the program is very flexible in responding to research trends, national needs, and minority participation. Analytical chemistry often overlaps with other fields; therefore, co-funding with other programs, as has been successfully accomplished in the past, needs to be continued where appropriate.

Program planning and prioritization process (internal and external) that guided the development of the portfolio under review.
Comments: No problems were noted. Workshops are valuable tools to help identify emerging fields of research and promote investment in these areas.

Discuss any concerns identified that are relevant to the management of the program.

There has been a promising turn around in the dwell time of the proposal review process. However, an effort should be made to expedite reviews longer than 6 months. Ideally all proposals should be mailed out for review within one month of receipt. NSF is encouraged to examine potential mechanisms for further expediting the review process, but maintain the quality of the review. It is understood that to a large extent this is due to limited staffing and resources (such as reviewer and literature databases).

We suggest that panels (perhaps video conferencing enabled or phone conferences) be used for evaluating high risk or boarder line projects.

PART B. RESULTS : OUTPUTS AND OUTCOMES OF NSF INVESTMENTS

NSF investments produce results that appear over time. The answers to the first three (People, Ideas and Tools) questions in this section are to be based on the COV's study of award results, which are direct and indirect accomplishments of projects supported by the program. These projects may be currently active or closed out during the previous three fiscal years. The COV review may also 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. Incremental progress made on results reported in prior fiscal years may also be considered.

The following questions are developed using the NSF outcome goals in the NSF Strategic Plan. The COV should look carefully at and comment on (1) noteworthy achievements of the year based on NSF awards; (2) the ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcomes; and (3) expectations for future performance based on the current set of awards. NSF asks the COV to provide comments on the degree to which past investments in research and education have contributed to NSF's progress towards its annual strategic outcome goals and to its mission:

- To promote the progress of science.
- To advance national health, prosperity, and welfare.
- To secure the national defense.
- And for other purposes.

Excellence in managing NSF underpins all of the agency's activities. For the response to the Outcome Goal for Organizational Excellence, the COV should comment, where appropriate, on NSF providing an agile, innovative organization. Critical indicators in this area include (1) operation of a credible, efficient merit review system; (2) utilizing and sustaining broad access to new and emerging technologies for business application; (3) developing a diverse, capable, motivated staff that operates with efficiency and integrity; and (4) developing and using performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

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

B.1 OUTCOME GOAL for PEOPLE: Developing "a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens."

The program makes a concerted effort to fund underrepresented scientist and should be commended for their efforts. For example, Proposal x was funded encouraging underrepresented minority scientists. Prop No. x was a complex interdisciplinary research proposal by a female team with widely ranging reviews and the PIs were allowed to provide a rebuttal that resulted in funding. Prop x initial declination was accompanied by constructive input which led to subsequent award between a HCBU and a private university with a team of female PIs. The CAREER awards have really encouraged new approaches in education including outreach and minority participation.

"Studies in Organized Media." CHE-0227281
Isiah Warner, Department of Chemistry, Louisiana State University
Isiah Warner has been recognized nationally as one of 20 new Howard Hughes Medical Institute Professors. Warner is a leading researcher in separation science. He will receive $1 million from HHMI over the next four years to continue his efforts to raise the participation of underrepresented groups in chemistry. Warner is developing a "mentoring ladder" reaching back into the secondary schools, where he says minorities often don't get the preparation they need for college science. He also received the ACS Award for Encouraging Disadvantaged Students into the Sciences at the National Meeting of the American Chemical Society in New Orleans in 2003, and the 2003 Council for Chemical Research Diversity Award.

B.2 OUTCOME GOAL for IDEAS: Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."

"CAREER: High-speed Electrophoretic Imaging of Biological Microenvironments," CHE-9734258

Jason Shear, Department of Chemistry, University of Texas at Austin

Chemical species that are created and degrade all within brief moments in time can be key to understanding chemical reactivity, and extensive effort has been devoted to the development of spectroscopic techniques for probing such ephemeral molecules. NSF CAREER awardee Jason B. Shear and graduate student Matthew L. Plenert at the University of Texas now report the use of electrophoresis to analyze transient molecules in mixtures in as little as a few microseconds — millions of times faster than conventional separation methods such as DNA sequencing. In this approach, photochemical intermediates of serotonin and other biological molecules are transported over distances approximately 1/10th the width of a human hair (I) in drawn capillaries where large voltage drops can be established over very short distances (II).

This electrophoretic method presents new opportunities for characterizing mixtures of short-lived compounds, and for probing properties difficult to measure using light alone, such as molecular charge. Shear and Plenert now hope to apply this method to study transient protein structures created as denatured proteins undergo the complex set of conformational changes necessary to adopt their biologically relevant states. Malfolded proteins are implicated in diseases such as Alzheimer's.

B.3 OUTCOME GOAL for TOOLS: Providing "broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation."

"Analysis of Trace Species in Gases," CHE-9902045

John B. Fenn, Department of Chemistry, Virginia Commonwealth University

John B. Fenn was awarded the 2002 Nobel Prize in Chemistry for his work developing mass-spectrometric analysis tools that allow scientists to "weigh" and identify large biological molecules. Conventional mass spectrometry techniques vaporize and ionize substances to identify individual molecules, but proteins are too fragile to survive such harsh methods. Fenn solved this problem by developing a technique to spray water droplets containing proteins into the mass spectrometer. The idea is to inject protein solutions into vacuum through a small hypodermic needle with a high voltage field at the tip. As the water evaporates, the protein molecules that are left behind can be analyzed. The technique is a major advance enabling the study of proteomics, and now researchers can identify proteins rapidly and analyze hundreds of potential drugs and biological samples per day. Fenn has received 13 research awards from the National Science Foundation since 1975.

B.4 OUTCOME GOAL for ORGANIZATIONAL EXCELLENCE: Providing "an agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices."

The Analytical and Surface Chemistry program has been particularly responsive not only to the needs of the scientific community, but the country. After 9/11 it was even more apparent that new technologies were needed to combat terrorism. Rapid development of new programs and emphases in response to this new and urgent need were apparent. For example, special grants were made available to develop new sensor technologies.

SGER: "Molecular Design of Intelligent Sensors for Selected Chemical Warfare Agents Using Support Vector Machines," CHE-0210968
Omowunmi Sadik, *Department of Chemistry, SUNY Binghamton*
Walker Land, *Department of Computer Science, SUNY Binghamton*

An SGER grant was awarded to Professors Omowunmi Sadik and Walker Land of SUNY Binghamton to apply Support Vector Machines (SVM, a computational intelligence technique) to analytical data on chemical warfare simulants. The analytical data originates from a hybrid sensor based on gas chromatography coupled with micro-arrays of conducting polymer-sensing elements, a so-called "electronic nose." The data from these arrays is complex and is appropriately studied using advanced pattern recognition techniques. This collaboration connects an analytical chemist with a computer scientist. The exploratory aspect is the opportunity for analytical chemists to take advantage of the advent of a new computational intelligence method that has been successfully applied by the co-PI to breast cancer detection. "Electronic noses" have the potential to serve as sensitive and selective detectors of mixtures of chemicals. There are many applications of such sensors, including homeland security, food quality, environmental monitoring, production processes, and transportation engineering. More sophisticated data analysis is required to bring next-generation sensors to fruition. The application of computer intelligence methods has resulted in a significant increase in classification accuracy. Using the S2000 kernel (with SVM), organophosphate nerve agent simulants dichlorvos, trichlorfon and paraoxon were accurately predicted.

PART C. OTHER TOPICS

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

An effective and flexible method for recruiting rotators should be developed especially considering the challenges of recruiting temporary staff, which requires PIs to leave their research and teaching for an extended period of time.

We suggest a workshop program for young investigators; possibly in combination with other divisions. The workshop would provide networking and mentorship for new investigators. It could include training in grantsmanship, dealing with NSF staff, and how to effectively integrate research, education, and outreach (see below as well).

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.

As discussed in the answers to previous questions, the implementation of the broader impacts criterion remains problematic. To the extent that broader impacts implies undergraduate education, graduate education, community education and outreach, and minority recruitment the current system seems to do a good job of at least encouraging PIs to consider this aspect of their research. At the same time however, systematic and professional review of these topics is not truly the domain of research chemists. We suggest consideration of methods to improve the quality of these ideas and reviews. One possibility is training symposia or workshops that combine researchers and experts in education and minority recruitment with chemistry researchers to discuss implementation of the latest education research in chemical programs.

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

We suggest that an NSF-wide searchable reviewer database is created that is consistently updated. This would also facilitate the review of interdisciplinary proposals.

A system to facilitate more interactions between programs with an emphasis on co-reviewing and co-funding proposal should be explored. This is particularly important for the ASC program where a number of the proposals could be interdisciplinary and benefit from the insight of other programs.

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

From 1991-2001, the ASC program was managed by rotators. We feel that the program clearly needs more continuity and the permanent staffing established in 2001 is an important step towards this goal, as evidenced by a significant decrease in the average dwell time of proposal and we applaud this achievement.

We feel that the NSF has made strides to encourage minority participation in science. Mentoring programs, such as those developed by Isiah Warner to work with students as early as high school, should be highlighted and duplicated to further expose under-represented groups to science.

We need to improve the image of chemistry in popular culture. For example, while space exploration has a positive public perception, the significant role of analytical chemistry in making the automated analysis on spacecraft possible does not seem to be as fully appreciated. Likewise, the important role of chemical analysis and sensors in combating terrorism is an attractive area for promoting the importance of chemistry in society.

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

Supply to COV statistics on how many of the PIs are actually recipients of multiple NSF grants and other agency grants. The committee has a concern that there are a number of researchers that have a track record of declined proposals. Perhaps NSF can develop a mechanism to provide further guidance for these researchers.

Simplify template with an emphasis on removing redundancy.

SIGNATURE BLOCK:

_____

For the ASC
Robert Kennedy
Chair

FY 2004 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

Date of COV February 3-5, 2004
Program/Cluster: Chemical Instrumentation & Special Initiatives
Division: Chemistry
Directorate: MPS
Number of actions reviewed by COV[7]: Awards: 14 Declinations: 8 Other: 0
Total number of actions within Program/Cluster/Division during period being reviewed by COV[8]: 702 Awards: 226 Declinations: 470 Other: 6 CGIs
Manner in which reviewed actions were selected: by SPO & CRIF program officers

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. Please do not take time to answer questions if they do not apply to the program.

A.1 Questions about the quality and effectiveness of the program's use of merit review procedures.

Provide comments in the space below the question. Discuss areas of concern in the space provided.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE

[7] To be provided by NSF staff.
[8] To be provided by NSF staff.

Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) Comments: Panels appear to be an excellent approach to dealing with instrumentation because a large number of proposals need to be reviewed and ranked in a short period of time. The use of panels suits the breadth of topics. Ad hoc reviewers should be used when there is no expertise on the panel, as is done now. The program officer has done an excellent job in balancing the reviews of the panel and the ad hoc reviews of a given proposal in the final ranking. In addition, the PO has carefully considered discrepancies between scores and comments.	Yes
Is the review process efficient and effective? Comments:	Yes
Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines? Comments: Ad-hoc reviewers need to be more strongly encouraged to provide input on both merit criteria; panel reviews are more effective in addressing these issues in the panel summaries. Send an example comprehensive ad-hoc review to reviewers so that they can model their review.	No
Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer's recommendation? Comments: Sometimes the reviews are too short and do not address specific strengths and weaknesses. NSF should provide examples of "good" reviews to the reviewers.	Mostly yes

Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments: Sometimes they are too short and do not provide information on specific strengths and weaknesses that would help in resubmission.	Too often not
Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: Better documentation of the discussion in the panel would be very helpful, particularly for proposals on the margin. In addition, the PO might consider making greater use of diary notes.	No
Is the time to decision appropriate? Comments:	Yes
Discuss issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures: More documentation on borderline cases would have made it easier on the COV to assess some of the decisions. Overriding issue is that not enough funds are available for the number of highly recommended proposals. If this situation remains, need a process to effectively rank the proposals that fall within the HR category.	

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers. Provide comments in the space below the question. Discuss issues or concerns in the space provided.

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Have the individual reviews (either mail or panel) addressed whether the proposal contributes to both merit review criteria? Comments: Reviewers are making more of an effort to comment on the broader impacts of a proposal. However, the intellectual merit was addressed more than the broader impact review. Again, an example of a comprehensive review would encourage more thorough evaluations. Make sure the solicitation includes information about potential broader impacts.	Mostly yes
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria? Comments:	Yes
Have the *review analyses* (Form 7s) addressed whether the proposal contributes to both merit review criteria? Comments:	Not applicable

Discuss any issues or concerns the COV has identified with respect to NSF's merit review system.

The merit review system could be enhanced through a process that prioritizes the highly recommended proposals. This is particularly necessary with the limited funding.

A.3 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
Did the program make use of an adequate number of reviewers for a balanced review? Comments:	Yes
Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments:	Mostly yes
Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: The COI restrictions make it very difficult to constitute properly balanced panels, especially with regard to representation of reviewers from peer institutions with the proper technical expertise. The geographic distribution of the reviewers is not an important issue. The type of institution and underrepresented groups is, and is appropriately distributed.	Mostly Yes
Did the program recognize and resolve conflicts of interest when appropriate? Comments:	Yes

Discuss any concerns identified that are relevant to selection of reviewers.

It is critically important to continue to maintain the effort to balance PUI, RUI, Ph.D., industrial, and national lab representation on the panels. However, the COV is concerned with the quality of some of the reviews and the qualifications of the reviewers. COI considerations make it extremely difficult to constitute panels with a breadth and depth of expertise, institutional comparability, and diversity. A better data base of reviewers and their matching (e.g. by keywords) to the proposals may help. NSF is encouraged to look at alternative ways to deal with the COI issue to make sure that panelists are consistent with the applicant pool.

A.4 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.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
Overall quality of the research and/or education projects supported by the program. Comments: Overall quality of the research is excellent and these request exceed the available funding.	appropriate
Are awards appropriate in size and duration for the scope of the projects? Comments:	appropriate
Does the program portfolio have an appropriate balance of: • High Risk Proposals? Comments: Appears that there is a lack of high risk in the proposals in the MRI and CRIF programs. Very few proposals involving instrument development, which is inherently high risk, are submitted/funded at this point.	appropriate
Does the program portfolio have an appropriate balance of: • Multidisciplinary Proposals? Comments:	appropriate
Does the program portfolio have an appropriate balance of: • Innovative Proposals? Comments:	Not applicable

Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals? Comments:	Yes
Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments:	Not applicable
Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments:	yes
Does the program portfolio have an appropriate balance of: • Institutional types? Comments: The funding of PUI for instrumentation is very important. The earmarked funds have assured this happens without competition with research universities and without impacting research universities.	yes
Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments:	Yes
Does the program portfolio have an appropriate balance: • Across disciplines and subdisciplines of the activity and of emerging opportunities? Comments:	Yes
Does the program portfolio have appropriate participation of underrepresented groups? Comments:	Yes

Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. Comments:	Yes
Discuss any concerns identified that are relevant to the quality of the projects or the balance of the portfolio. As new areas such as NIRT and ITR come forward, it is critical to continue the commitment to the core programs.	

A.5 Management of the program under review. Please comment on:

Management of the program. Comments: The program management has improved greatly in the last few years.
Responsiveness of the program to emerging research and education trends. Comments: Initiative programs are demonstrating appropriate response to emerging research.
Program planning and prioritization process (internal and external) that guided the development of the portfolio under review. Comments: ~~No comment~~
Discuss any concerns identified that are relevant to the management of the program. It is a challenge to manage a program that is so diverse and addresses different needs. It is sometimes hard to decide between competing proposals. More detailed reasoning by reviewers will help the program manager to make the final decision.

PART B. RESULTS : OUTPUTS AND OUTCOMES OF NSF INVESTMENTS

NSF investments produce results that appear over time. The answers to the first three (People, Ideas and Tools) questions in this section are to be based on the COV's study of award results, which are direct and indirect accomplishments of projects supported by the program. These projects may be currently active or closed out during the previous three fiscal years. The COV review may also 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. Incremental progress made on results reported in prior fiscal years may also be considered.

The following questions are developed using the NSF outcome goals in the NSF Strategic Plan. The COV should look carefully at and comment on (1) noteworthy achievements of the year based on NSF awards; (2) the ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcomes; and (3) expectations for future performance based on the current set of awards. NSF asks the COV to provide comments on the degree to which past investments in research and education have contributed to NSF's progress towards its annual strategic outcome goals and to its mission:

- To promote the progress of science.
- To advance national health, prosperity, and welfare.
- To secure the national defense.
- And for other purposes.

Excellence in managing NSF underpins all of the agency's activities. For the response to the Outcome Goal for Organizational Excellence, the COV should comment, where appropriate, on NSF providing an agile, innovative organization. Critical indicators in this area include (1) operation of a credible, efficient merit review system; (2) utilizing and sustaining broad access to new and emerging technologies for business application; (3) developing a diverse, capable, motivated staff that operates with efficiency and integrity; and (4) developing and using performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

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

B.1 OUTCOME GOAL for PEOPLE: Developing "a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens."

Comments:

NSF should be commended for their success in developing a diverse and globally engaged workforce. They have clearly made a great impact in these areas and should be encourage to maintain this effort.

During this period, investigators at primarily undergraduate institutes received between 40-50% of the chemical instrumentation awards. At many of these institutions, the instrumentation was used not only by undergraduate students involved in research, but also to enhance instruction in advanced undergraduate classes.

At least 10 awards were co-funded by the NSF-EPSCoR program. In addition, several were granted to minority-serving institutions.

The instrumentation program accesses many people in diverse institutions and is very successful. A good example is the proposal from North Carolina A&T U (#0317836) that introduces research into a traditionally black college and provides the necessary infrastructure.

B.2 OUTCOME GOAL for IDEAS: Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."

Comments:

New instrumentation is an integral part of this goal. The outcome of the proposals demonstrates that excellent science is being done as a result of NSFs support. Furthermore, the COV recognizes that the stewardship of NSF to emphasize broader impacts along with intellectual merit has enabled more innovation and service to society.

The CRIF program supported two workshops on neutron scattering in September 2003. Roughly 150 scientists attended the two overlapping workshops.l

B.3 OUTCOME GOAL for TOOLS: Providing "broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation."

Comments:
There were several important machines acquired in the biochemical areas: CHE-0131048 Wasielewski Northwestern EPR –DNA repair and CHE-0130835 Dryhurst Oklahoma, X-ray diffractometer for NO binding to hemoglobin. Other research areas were equally well represented.

The CRIF Facilities Program provides continuing support for two national user facilities: CHE-0087817 Viccaro ChemMatCARS at APS and CHE-9909502 Marshall FT-ICR. These facilities are open to use by researchers around the country.

The CRIF also provided funds for the development of an instrument for aerosol and bacteria analysis by laser desorption Fourier Transform Mass Spectrometry –CHE-0079240. This is an innovative, high risk direction.

B.4 OUTCOME GOAL for ORGANIZATIONAL EXCELLENCE: Providing "an agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices."

Comments:

The successful six-month review process demonstrates that they are an agile organization with new innovative approaches for review. However, the program managers have a overwhelming work loads and would greatly benefit from more permanent staff.

PART C. OTHER TOPICS

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

COI considerations make it extremely difficult to constitute panels with a breadth and depth of expertise, institutional comparability, and diversity. A better database of reviewers and their matching (e.g. by keywords) to the proposals may help.
NSF is encouraged to look at alternative ways to deal with the COI issue to make sure that panelists are consistent with the applicant pool.

The CRIF facilities program needs to be redesigned given the low number of proposals received for this call. Encourage further evaluation of the CRIF program with respect to the current facility needs of the community. The planned workshop for fall 2004 will help address this issue.

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.

No comment

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

Compliance is an important issue for fairness in reviewing proposals. Dealing with noncompliance delays the review process and so strong statements should be issued encouraging PIs to comply. NSF should allow only very limited file updates for meeting compliance.

Overall funding for the physical sciences needs to be enhanced.

Consider the earlier comments regarding COI concerns.

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

When an initiative is completed, the budgeted money for the initiative needs to be folded back into the core.

Better access to electronic data bases (e.g. SciFinder) would help the program officers greatly.

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

For the information provided to the COV, the complete previous COV report for each program should be provided.

SIGNATURE BLOCK:

_____

For the CRIF/NANO/ITR COV
Toshiko Ichiye
Chair

FY 2004 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

Date of COV February 5, 2004
Program/Cluster: Inorganic, Bioinorganic and Organometallic
Division: CHE
Directorate: MPS
Number of actions reviewed by COV[9]: Awards: 13 Declinations: 8 Other:
Total number of actions within Program/Cluster/Division during period being reviewed by COV[10]: Awards: 198 Declinations: 352 Other:
Manner in which reviewed actions were selected: 21 selected by IBO staff; 1 additional by First Round IBO Review Committee; 2 additional by IBO Second Round IBO Review Committee

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. Please do not take time to answer questions if they do not apply to the program.

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

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE

[9] To be provided by NSF staff.
[10] To be provided by NSF staff.

Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) Comments: Mostly ad hoc reviews for single investigators, panels for CAREER, panels for marginal proposals, when possible. These mechanisms are appropriate for the various categories. Review process is working well. There is a good mix of review mechanisms (no site reviews were evaluated). The occasional panel review of marginal proposals provides an extra measure of validity.	Yes
Is the review process efficient and effective? Comments: Efficiency is defined as meeting the dwell time within the program. The statistics suggest that the review process is quite efficient in providing timely feedback (increasing dramatically the past several years). The transition to electronic record keeping is likely a plus. The review process is effective in generating a strong set of funded proposals.	Yes
Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines? Comments: Most proposals reviewed were PI-initiated, not responding to special solicitations. In PI initiated proposals there are now two criteria, the second including broader impacts of the proposed research. Some reviews addressed both of these criteria but some did not. Some of the panel members felt that some reviewers deliberately ignored the broader impact criterion. The reviewers and PI's are more conscientious in responding to criterion 2 in the last year or two, but the COV notes that improvement is needed in this area. The request for review now solicits information on NSF criteria and the letter from Art Ellis has defined more clearly aspects to be included in criterion two, which will hopefully result in a higher compliance rate in written reviews.	Yes
Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer's recommendation? Comments: Mostly yes. Most reviews have constructive criticisms and sufficiently detailed reviews to assist both the program manager and the PI. Some, however, are too short and vague. These later tend to be weighted less than more substantive reviews. Some felt that not enough feedback is given to the PI on criterion 2 (in outreach and education). Some felt that more attention is paid to criterion 2 when the PI is from an underrepresentative group.	Yes/No
Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation?	Mostly yes

Comments: The panel summaries are very informative and helpful to the PI's. Some felt that in cases where the panel summary is incomplete that any efforts to supplement the summary with the review analysis or other written documentation would be helpful to the PI, especially in the case of a declined proposal.	
Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: Form 7 summaries for the rationale for decisions fairly balances the reviewers' criticisms and praises. They are thorough and appropriately weigh criteria 1 and 2. The panels were very impressed with the program review summaries, which provide good analysis and justification for the decisions. If a similar form of analysis could be conveyed to the Pis, it might be helpful.	Yes
Is the time to decision appropriate? Comments: Response time is very good.	Yes
Discuss issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures:	

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers. Provide comments in the space below the question. Discuss issues or concerns in the space provided.

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Have the individual reviews (either mail or panel) addressed whether the proposal contributes to both merit review criteria? Comments: Criterion 1 always appears to be adequately addressed. Criterion 2 is most often treated per the requirements of the FastLane submission, and more attention is being paid to this criterion. Still the quality of responses vary. More elaboration could be required (and standards offered).	Yes/No
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria? Comments: Despite the lack of effort addressing criterion 2 by some PI's and some ad hoc reviewers, all panel summaries address both review criteria. The COV thinks this is largely due to the guidance of program managers over the course of the panel reviews.	Yes
Have the *review analyses* (Form 7s) addressed whether the proposal contributes to both merit review criteria? Comments: The program officers provide very clear executive summaries (form 7s) for the basis of their decisions. In some cases this was supplemented with other information (from the PI's CV, etc) available to the program officer, as appropriate. They are to be commended for their careful reading of the text and the reviews and subsequent integration of all relevant factors, both criteria 1 and 2, and arriving at funding decisions. Tough decisions on marginal proposals have been made fairly. Unfortunately, many highly meritorious proposals have gone unfunded.	Yes

Discuss any issues or concerns the COV has identified with respect to NSF's merit review system. The panelists felt that consideration of the broader impact is an important addition to the proposal review. The reviews of proposals reflect an understanding of how to rate the intellectual merit of a proposal, but similar criteria are not widely practiced for criterion 2. There is still a wide divergence of understanding in the reviewer community regarding Criterion 2 and the community needs to help communicate and be responsive to the "standards" laid out in the "Dear Colleague" letter by Art Ellis.	

A.3 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
Did the program make use of an adequate number of reviewers for a balanced review? Comments: Usually 8-15 reviewers were contacted and, on average, at least 5 reviews were received. The panel feels that four or more reviews provided the best balanced perspective.	Yes
Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: The mail reviewers were well chosen, which appears to be a very difficult task for the program officers given the lack of a more comprehensive database or library tools. An attempt has also been made to include senior expertise on reviews, but response is not always forthcoming from these investigators.	Yes
Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: We were gratified that there was a concerted attempt to include reviewers appropriate to the type of proposal (e.g. undergraduate institutions). The program officers are to be commended in their efforts to increase diversity of reviewers, and should be encouraged to continue these efforts. In most cases there were reviewers from a range of institutions, including smaller institutions. In cases where the PI is female, a good mix of female reviewers is chosen. The reviewers come from a good mix of geographical institutions. The inclusion of foreign reviews is applauded, provided that the program officers are cognizant of prevailing cultural differences.	Yes

Did the program recognize and resolve conflicts of interest when appropriate? Comments: Yes, and in addition, good documentation was provided for this resolution.	Yes
Discuss any concerns identified that are relevant to selection of reviewers. The Program Officers need access to better electronic library tools (e. g. Scifinder). They are developing a database of reviewers and we strongly support this process. Having this tool will help them include more women and underrepresented minorities as reviewers.	

A.4 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.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
Overall quality of the research and/or education projects supported by the program. Comments: The quality of the research program is outstanding. The panel is impressed by the quality of the research programs across the breadth of the IBO portfolio.	Appropriate
Are awards appropriate in size and duration for the scope of the projects? Comments: Award sizes remain modest. Given the total number of dollars. Program officers are doing a very good job balancing resources. Hopefully budgets can be increased, and perhaps longer award durations may be feasible.	Appropriate
Does the program portfolio have an appropriate balance of: • High Risk Proposals? Comments: Program officer discretion was used in certain instances to make higher-risk awards. In addition, SGER is an attractive mechanism for funding high-risk initial work.	Appropriate
Does the program portfolio have an appropriate balance of: • Multidisciplinary Proposals? Comments: About 10-15% are co-funded with other programs. Only a very small number of GOALIEs are funded in this program.	Appropriate
Does the program portfolio have an appropriate balance of: • Innovative Proposals? Comments: We were impressed with the standard of innovation that program officers set for both new and more established investigators.	Yes

Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals? Comments: Only a very few collaborative proposals are included in the portfolio. Most folders reviewed were for individual investigators.	Appropriate
Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments: The percentages are in-line with the Division-wide percentages and so are deemed to be appropriate	Appropriate
Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments: Suitably diverse.	Appropriate
Does the program portfolio have an appropriate balance of: • Institutional types? Comments: Suitably diverse.	Appropriate
Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments: These were primarily research awards, and as such education was treated principally under the criterion 2 evaluation. Because of the change in reviewing criteria, all funded proposals contain a discussion of education. The balance varies from PI to PI.	Appropriate
Does the program portfolio have an appropriate balance: • Across disciplines and subdisciplines of the activity and of emerging opportunities? Comments: The breadth of the portfolio in this program is very impressive.	Appropriate
Does the program portfolio have appropriate participation of underrepresented groups? Comments: Efforts are clearly being made to support underrepresented groups. However, we encourage the program officers to make even more effort to increase the participation of faculty from all institutions, especially where under-represented groups make up a larger fraction of the faculty.	Maybe appropriate but needs more attention

Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. Comments: A number of times the competitiveness of the US in inorganic materials science was sited in the decision to fund proposals. Students and postdocs trained enter industries critical to national health and defense industries.	Yes
Discuss any concerns identified that are relevant to the quality of the projects or the balance of the portfolio.	

A.5 Management of the program under review. Please comment on:

Management of the program. Comments: As mentioned above, the program officers are doing a good job. They handle proposals in an efficient manner, they do thoughtful analysis of reviews, and they apply discretion in making funding decisions in a measured and well-reasoned way.
Responsiveness of the program to emerging research and education trends. Comments: The program has clearly embraced collaborative proposals. The move of the supramolecular area proposals from the nano initiative to the program is viewed as a positive development. Green chemistry is a new, positive development as well. The program has effectively integrated criterion 2 into the evaluation process on the part by the program managers. Criterion 2 has affected the development of innovative education and outreach activities.
Program planning and prioritization process (internal and external) that guided the development of the portfolio under review. Comments: Input from workshops, the attendance of program officers at national meetings, and the last COV affected the direction of the program in a positive way.
Discuss any concerns identified that are relevant to the management of the program. We have a concern that staffing levels are low in IBO, especially considering the addition many materials chemistry proposals to the portfolio. The proposal load has increased by nearly one-third to 232 in FY2003 and about the same in FY2004. At some point, this will negatively impact the dwell time and the quality of the review process. The panel felt that the IBO program officers have done a very good job of managing their program.

PART B. RESULTS : OUTPUTS AND OUTCOMES OF NSF INVESTMENTS

NSF investments produce results that appear over time. The answers to the first three (People, Ideas and Tools) questions in this section are to be based on the COV's study of award results, which are direct and indirect accomplishments of projects supported by the program. These projects may be currently active or closed out during the previous three fiscal years. The COV review may also 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. Incremental progress made on results reported in prior fiscal years may also be considered.

The following questions are developed using the NSF outcome goals in the NSF Strategic Plan. The COV should look carefully at and comment on (1) noteworthy achievements of the year based on NSF awards; (2) the ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcomes; and (3) expectations for future performance based on the current set of awards. NSF asks the COV to provide comments on the degree to which past investments in research and education have contributed to NSF's progress towards its annual strategic outcome goals and to its mission:

- To promote the progress of science.
- To advance national health, prosperity, and welfare.
- To secure the national defense.
- And for other purposes.

Excellence in managing NSF underpins all of the agency's activities. For the response to the Outcome Goal for Organizational Excellence, the COV should comment, where appropriate, on NSF providing an agile, innovative organization. Critical indicators in this area include (1) operation of a credible, efficient merit review system; (2) utilizing and sustaining broad access to new and emerging technologies for business application; (3) developing a diverse, capable, motivated staff that operates with efficiency and integrity; and (4) developing and using performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

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

B.1 OUTCOME GOAL for PEOPLE: Developing "a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens."

Comments: There are examples of program officer decisions that reflect this goal, for instance: #0315152 – award to Peterson, Francis Marion University, an award was made to a collaborative proposal between University of South Carolina and Francis Marion University. Despite lower overall scores (based upon higher risk and questions about the lower level of research activity at the small school), an award was made on the strength of the interaction with a smaller school with a higher population of underrepresented minorities.

B.2 OUTCOME GOAL for IDEAS: Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."

Comments: We saw good evidence of supporting work with industrial and societal relevance, including: #0213165 – R. Kemp (UNM), funding a GOALI project between UNM and GE on synthetic approaches to PET imaging agents.

In addition, the program officer took the initiative (as witnessed in diary notes) to hook a PI (#0139876, D. Margerum, Purdue U.) conducting research up with a customer (EPA) who may have urgent need of expertise in the national interest.

B.3 OUTCOME GOAL for TOOLS: Providing "broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation"

Comments:

Multidisciplinary interactions and proposal-co-funding provide new tools and perspectives to PI's. Small amounts of funding are provided for individual PI's.

B.4 OUTCOME GOAL for ORGANIZATIONAL EXCELLENCE: Providing "an agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices."

Comments:
The dwell time is very good despite the fact that the program is under-staffed. They are agile, they follow up with reviewers, they work hard to be fair in their evaluation of proposals, there is transparency in the process, the research is of very high quality.

PART C. OTHER TOPICS

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

No gaps are identified.

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.

Everything is covered.

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

Improve staffing levels and provide access to electronic databases. Funding level should be improved to make an impact on this area of chemistry.

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

The committee has noted that with the current leadership (Art Ellis) the division has taken a strong leadership role in inter-agency coordination and planning, which should be commended.

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

To address many of the important issues regarding the portfolio, information (esp. statistical information on geographic, institutional and diversity distributions) and time need to be allotted for the COV panel to review these questions (e. g. A4). This was also noted in the last COV report. It would also be more convenient, to hold the COV panel in the summer so that participants will not have to deal with winter weather for traveling and academic panelists will not have to miss classes.

SIGNATURE BLOCK:

Kristin Bowman-James

Jennifer Holmgren

Joanne Stewart

Susan Sinnot

Carol Burns

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For the IBO Merge COV
Kristin Bowman-James, Chair, February 5, 2004

FY 2004 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

Date of COV 2/3/04-2/5/04
Program/Cluster: Organic and Macromolecular Chemistry
Division: Chemistry
Directorate: MPS
Number of actions reviewed by COV[11]: Awards: 16 Declinations: 16 Other:
Total number of actions within Program/Cluster/Division during period being reviewed by COV[12]: Awards: 288 Declinations: 550 Other: 87
Manner in which reviewed actions were selected: Divisional guidelines

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. Please do not take time to answer questions if they do not apply to the program.

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

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE

[11] To be provided by NSF staff.
[12] To be provided by NSF staff.

Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) Comments: Ad Hoc reviewers are well chosen and reviews usually well done. Some of the outside reviews are too short to be of much value, particularly with positive reviews. We recognize that this is a phenomenon over which program officers have very little control. The policy of requiring three substantive reviews is appropriate. More frequent inclusion of senior investigators, rather than relying primarily on mid-career researchers is recommended. No site visits were mentioned; however, they may not be appropriate for these awards.	Yes
Is the review process efficient and effective? Comments: Based on our examination of 32 representative jackets, the review process works well. If funds were available, a significant number of additional meritorious proposals could be funded.	Yes
Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines? Comments: Assessment of "criterion 2" is improving dramatically, especially in Career proposals. However, there is still a wide range of results in this category, some addressing the broader impacts explicitly some ignoring them completely. As a result the reviews are not always evaluated by the same measure, and it is difficult to assess if the final score reflects both criteria.	Yes
Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer's recommendation? Comments: Ad hoc reviewers provide, as a whole, appropriate information for decision making on proposals. Program officers have been highly effective in obtaining the appropriate quality and quantity of reviewers per proposal. Interdisciplinary proposals require a particularly broad set of reviewers with appropriate expertise. We support the current policy of maintaining confidentiality of the "form seven" summaries. In the case of the declinations, more explicit information should be required, especially in the clear declinations where the PI needs a full	Yes

understanding of the reasoning of the panel.	
Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments: The brevity of the Margin panel and Career panel summaries don't do justice to the level of discussion which our experience leads us to know takes place. More detailed panel summaries would be very helpful to PI's, especially for borderline proposals likely to be declined.	No
Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: The program officers provide excellent executive summaries ("form seven") which reflect both the concerns and enthusiasm of the reviewers. In one case involving reconsideration of a declined proposal, the program officer showed excellent professionalism and guidance to the young investigator involved.	Yes
Is the time to decision appropriate? Comments: There has been significant improvement in this area, and we can't imagine the decision-making process proceeding much more quickly. The staff should be commended for keeping this short even with a heavy workload.	Yes

Discuss issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures:

There is a uniform agreement that criterion I is well addressed, however, criterion II still needs improvement. We questioned whether there was any formal mechanism for follow-up on the educational plan included in Career proposals, in particular on the first regular submission. The final report allows a chance to see what the progress on the educational component was, but there is no strong incentive for continuity of this component of the program. It remains to be seen how the increasing importance of criterion 2 will affect this.

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers. Provide comments in the space below the question. Discuss issues or concerns in the space provided.

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Have the individual reviews (either mail or panel) addressed whether the proposal contributes to both merit review criteria? Comments: Individual reviews are addressing both criteria, but for criterion 2 not as consistently and uniformly as desirable.	Yes
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria? Comments: The level of detail in the panel review statements is very inconsistent. In some cases the summary statements do not reflect to what extent the panel considered both criteria consistently.	No
Have the *review analyses* (Form 7s) addressed whether the proposal contributes to both merit review criteria? Comments: With very few exceptions, Program officers evaluate the reviewers' comments on both criteria, in some cases providing an additional perspective that includes the background of the PI, and the type of institution.	yes

Discuss any issues or concerns the COV has identified with respect to NSF's merit review system. There seems to be a problem with the efficiency of identifying qualified reviewers. This is particularly a problem given the large number of proposals that arrive shortly before the yearly deadlines. The task of program officers would be facilitated by a well indexed, searchable, and regularly updated reviewer database. Inclusion of a new criterion that specifically addresses innovation should be considered. This might help to distinguish between borderline proposals. The committee also questioned if there was a stated mechanism for a PI to address omissions identified by reviewers or panelists considered pertinent to the fundability of the proposal.	

A.3 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
Did the program make use of an adequate number of reviewers for a balanced review? Comments: The number of reviewers, as well as the criterion to have at least 3 substantive reviews is appropriate. The program officer might consider using a few selected reviewers for a larger number of proposals (10) to gain additional perspective on that round of proposals. This would be most effective if used in an interlocking fashion that complements the regular review system.	Yes
Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: Yes, in most cases. Some reviewers self-identified as not having expertise in specific areas. That should be remedied. More frequent inclusion of one senior investigator of high stature in the field, rather than relying primarily on mid-career researchers, is recommended.	Yes
Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: These issues are well addressed by the program officers.	Yes

Did the program recognize and resolve conflicts of interest when appropriate? Comments: Program officers are very thorough when dealing with conflict of interest issues. This conclusion was backed up by several examples showing excellent program officer judgement.	Yes
Discuss any concerns identified that are relevant to selection of reviewers. There seems to be a problem with the efficiency of identifying qualified reviewers. This is particularly a problem given the large number of proposals that arrive shortly before the yearly deadlines. The task of program officers would be facilitated by a user-friendly, searchable, and regularly updated reviewer database.	

A.4 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.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
Overall quality of the research and/or education projects supported by the program. Comments: Projects supported are of very high quality, reflecting a high quality proposal pool as well as a highly selective process. Many proposals that are declined are still highly meritorious and fundable.	Yes
Are awards appropriate in size and duration for the scope of the projects? Comments: The overall size of grants is not increasing at the rate of scientific inflation. This is especially the case when dealing with disproportionately rising personnel costs. Rising personnel costs dictated by educational institutions need to be considered when setting future funding levels. The balance between grant size, duration, and numbers of supported programs requires constant reevaluation. A flexible solution would be to encourage the program officer to grant merit-based creativity extensions after the second year progress reports.	Yes
Does the program portfolio have an appropriate balance of: • High Risk Proposals? Comments: A significant number of proposals (ca. 15%) can be placed in the high-risk category, and the 01-03 funding rate for these proposals is above average. For some high-risk research areas it might be appropriate to lengthen the grant period to 4 or 5 years. This could reduce the PI's concerns about diminished chances of renewal funding for high-risk proposals. The availability of second-year creativity extensions would further address these concerns. Some high-risk proposals are also supported through the SGER program.	Yes

Does the program portfolio have an appropriate balance of: • Multidisciplinary Proposals? Comments: The balance is appropriate, given the budget constraints. This need is also well addressed by the CRC program. The use of new workshops to identify new areas of interdisciplinary initiatives is recommended.	Yes
Does the program portfolio have an appropriate balance of: • Innovative Proposals? Comments: All the funded proposals support highly innovative research.	Yes
Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals? Comments: We recommend that the current percentage of the programs' resources dedicated to individual investigator awards be maintained.	Yes
Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments: The CAREER proposal system serves new investigators very well, and ensures a steady stream of young investigators in the funding pipeline, without discouraging mid-career and senior investigators who lose funding for ongoing productive research programs. The yearly organic synthesis and dynamics workshops have a long tradition of supporting young investigators and introducing them to the NSF funding system.	Yes
Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments: The COV panel was provided with statistics documenting proper geographical distribution of funding.	yes
Does the program portfolio have an appropriate balance of: • Institutional types? Comments: Very appropriate.	Yes

Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments: Criterion two and the CAREER proposal program aid in this integration and stimulate continued innovation in education.	yes
Does the program portfolio have an appropriate balance: ▪ Across disciplines and subdisciplines of the activity and of emerging opportunities? Comments: Appropriate. New workshops could be used to explore new research directions.	Yes
Does the program portfolio have appropriate participation of underrepresented groups? Comments: Percentages of Women PI's are rapidly increasing. Participation of underrepresented minorities should be further enhanced, but is representative of the current academic and scientific demographics of these groups. The program officers are very sensitive to these issues and should be commended on their vigorous efforts to increase minority representation.	Yes
Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. Comments: The program should continue to stress hypothesis-driven research initiated by individual investigators. Innovations arising from research supported by this program have had a clear impact on the national and international competitiveness of the United States. The track record of Nobel Laureates historically funded by this program supports this mode of operation. The areas of challenges for chemistry and chemical engineering identified in the 2003 report of the National Research Council coincide with many of the research priorities and funding directions in OMC.	Yes
Discuss any concerns identified that are relevant to the quality of the projects or the balance of the portfolio. None.	

A.5 Management of the program under review. Please comment on:

Management of the program. Comments: The program reflects excellent stewardship and leadership by the program officers. The program management is highly visible and actively participating in the scientific community.
Responsiveness of the program to emerging research and education trends. Comments: There is a strong commitment to encouraging participation by minorities and undergraduate researchers. In addition to special programs which address the needs of young investigators and high-risk research areas, participation of the program officers in scientific meetings and workshops keeps them apprised of emerging areas.
Program planning and prioritization process (internal and external) that guided the development of the portfolio under review. Comments: The PO and his staff respond appropriately to PI driven external proposal pressure. In addition to special programs which address the needs of young investigators and high-risk research areas, the use of rotators and the participation of the program officers in scientific meetings and workshops keeps them apprised of emerging areas.
Discuss any concerns identified that are relevant to the management of the program. See previous comments about reviewer database problems.

PART B. RESULTS : OUTPUTS AND OUTCOMES OF NSF INVESTMENTS

NSF investments produce results that appear over time. The answers to the first three (People, Ideas and Tools) questions in this section are to be based on the COV's study of award results, which are direct and indirect accomplishments of projects supported by the program. These projects may be currently active or closed out during the previous three fiscal years. The COV review may also 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. Incremental progress made on results reported in prior fiscal years may also be considered.

The following questions are developed using the NSF outcome goals in the NSF Strategic Plan. The COV should look carefully at and comment on (1) noteworthy achievements of the year based on NSF awards; (2) the ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcomes; and (3) expectations for future performance based on the current set of awards. NSF asks the COV to provide comments on the degree to which past investments in research and education have contributed to NSF's progress towards its annual strategic outcome goals and to its mission:

- To promote the progress of science.
- To advance national health, prosperity, and welfare.
- To secure the national defense.
- And for other purposes.

Excellence in managing NSF underpins all of the agency's activities. For the response to the Outcome Goal for Organizational Excellence, the COV should comment, where appropriate, on NSF providing an agile, innovative organization. Critical indicators in this area include (1) operation of a credible, efficient merit review system; (2) utilizing and sustaining broad access to new and emerging technologies for business application; (3) developing a diverse, capable, motivated staff that operates with efficiency and integrity; and (4) developing and using performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

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

B.1 OUTCOME GOAL for PEOPLE: Developing "a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens."

Comments:

Undergraduates, graduate students, and postdoctoral fellows supported by the NSF in the OMC sponsored projects acquire highly relevant skills and are highly sought after by the chemical industry. These graduates are critical to national defense, health care, and other important national priorities. CHE 0111522 A. Howell, Univ. of Connecticut is an example for the development of a diverse and competent engaged workforce.

On average, the OMC program supports annually 220 PI's, 150 postdoctoral associates, 400 graduate students and 140 undergraduates. Women and underrepresented minorities comprise a significant fraction of this group. Graduates from these programs are a critical element of the Nation's workforce in Health, Service and Defense. The OMC program supports two workshops every year that bring together young scientists from academics and industry to exchange ideas and emerging new science and plan collaborative interactions. Since 1970, over 500 attendees have benefited from these workshops.

The quality of the PI's supported is evident from the national and international awards generated by these individuals. In addition to a Nobel prize (2001), a Kyoto prize (2003) and an NSF director's award, recognition by industry is also significant: Since 1993, 24 of the 31 young faculty Eli Lilly Grantee awards have had OMC support.

B.2 OUTCOME GOAL for IDEAS: Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."

Comments:

Criterion 2 ensures that research activities remain connected to the educational infrastructure and are relevant to areas of national need.

The OMC program sponsors many noteworthy efforts across the frontier of science and service to society. Prof. Sam Gellman at the University of Wisconsin (CHE-9820952) carries out fundamental studies of noncovalent interactions and elucidates folding patterns that will shed light on structural preferences of proteins and DNA. Professor Krzysztof Matyjaszewski's group at Carnegie Mellon University (CHE- 0096601, "Mechanistic Studies of Atom Transfer Radical Polymerization (ATRP)") has studied new methods for polymerization. This work will facilitate the preparation of novel polymeric materials of high commercial relevance. Synthesis is a critical enabling technology for the pharmaceutical, agrocultural and fine chemical industries in the United States. Professor Bruce Lipshutz of the University of California at Santa Barbara has devised an efficient synthesis of coenzyme Q10 whose significance for respiration and heart muscle strength is increasingly recognized. Prof. Larry Overman of the University of California at Irvine (CHE-0317170) develops new catalytic enantioselective reactions. This is an area of high impact for society that has also been recognized by the 2001 Nobel prize to Prof. Barry Sharpless of the Scripps Research Institute (CTS-9985553).

CHE 0317170 J. F. Stoddart, UCLA ; Innovative integration of fundamental science ideas into applications in polymers, demonstrates excellent outreach to secondary schools in the greater Los Angeles area and the public.

B.3 OUTCOME GOAL for TOOLS: Providing "broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation."

Comments: The OMC program does not directly support projects associated to instrument development or facilities. However, much of the sponsored research provides the necessary intellectual background and the testing ground for new tools that provide critical feedback to the development teams. New methodologies in organic chemistry represent an enabling technology for drug discovery and new materials synthesis.

B.4 OUTCOME GOAL for ORGANIZATIONAL EXCELLENCE: Providing "an agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices."

Comments: OMC has spearheaded in part the development of e-jacket and is leading efforts to reduce proposal dwell time.

PART C. OTHER TOPICS

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

None.

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.

None.

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

Development of a searchable reviewer database should be pursued with high priority.

Some form of reviewer training (especially for new reviewers) which sets expectations and standards specifically for ad-hoc reviews should be considered. This could be carried out by providing an example of a good review with some comments as to what aspects of the review contribute positively to review quality. This would also clarify the expectations with regard to comments on criterion II.

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

With the increase in workload and proposal pressure, an increase in staffing at the PO level is necessary. The workload of the PO is overwhelming.

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

- The COV should address a few specific questions on the role of NSF in the context of the overall science funding environment in the United States.
- Provide more statistics up front to COV panels; (funding rates by state, integrative research and education activities, PUI eligible awards, RUI awards and funding rates; underrepresented minority and gender funding; 3-year trends)
- Number content boxes; include as many blank templates as program evaluations.

SIGNATURE BLOCK:

_____

For the OMC
Peter Wipf
Chair

NATIONAL SCIENCE FOUNDATION
4201 Wilson Boulevard, Arlington, Virginia 22230

Office of the Assistant Director
Mathematical and Physical Sciences
September xx, 2003
Dr. xxx
Address

Dear Dr. xxx,

Thank you for agreeing to serve on [serve as Chair of] the FY 2004 Committee of Visitors (COV) for the Division of Chemistry (CHE). The COV Review will take place at the NSF in Arlington, Virginia, on Tuesday through Thursday, February 3-5, 2004; we expect to begin early Tuesday morning and conclude by mid-afternoon Thursday. The COV is an *ad hoc* subcommittee of the Mathematical and Physical Sciences Advisory Committee (MPSAC). Your appointment to the COV commences January 1, 2004 and ends with the presentation of the COV report to the MPSAC on April 2, 2004.

By NSF policy, each program that awards grants and cooperative agreements must be reviewed at three-year intervals by a COV comprised of qualified external experts. The COV is charged to address and prepare a report on:

- the integrity and efficacy of processes used to solicit, review, recommend, and document proposal actions;
- the quality and significance of the results of the Division's programmatic investments;
- the relationship between award decisions, program goals, and Foundation-wide programs and strategic goals;
- the Division's balance, priorities, and future directions;
- the Division's response to the prior COV report of 2001
- any other issues that the COV feels are relevant to the review.

A more complete description of the charge to the COV is provided as an attachment. The COV report is made available to the public to ensure openness to the research and education community served by the Foundation.

Decisions to award or decline proposals are ultimately based on the informed judgment of NSF staff, based on evaluations by qualified reviewers who reflect the breadth and diversity of the proposed activities and the community. Systematic examination by the COV of a wide range of funding decisions by the COV provides an independent mechanism for monitoring and evaluating the overall quality of the Division's decisions on proposals, program management and processes, and results.

The review will assess operations of individual programs in CHE as well as the Division as a whole for three fiscal years: FY 2001, FY 2002, and FY 2003. The CHE programs under review include:

• Analytical and Surface Chemistry
• Inorganic, Bioinorganic and Organometallic Chemistry
• Organic and Macromolecular Chemistry
• Physical Chemistry
• Special Projects Office, which includes Chemistry Research Instrumentation and Facilities (CRIF), collaborative projects, and chemistry education

The general outline of the meeting will be an introductory session in which the Division Director, Art Ellis, will present an overview of the Division's activities and plans, a brief overview of each program, and a review of statistical information and procedures. Following this session, the COV will break into subpanels for each program to examine program documentation and results and to prepare program-level review reports. This is expected to require about half of the meeting time. The remaining time will be spent on a review of the Division as a whole and preparation of a Division-level report, based on the program-level reports and other material as appropriate.

Drafts of the program-level reports and the Division-level report will be completed during the COV meeting. The [As] Chair of the COV [, you] will finalize and submit the full report by February 19 to allow time for comment and distribution of the report to the full MPSAC prior to their meeting on April 1-2, 2004. [You will officially present the report to the MPSAC at this meeting and summarize it.]

Art Ellis (703-292-4960, aellis@nsf.gov) will send you an agenda and background information to assist you in conducting this review 3 - 4 weeks prior to the meeting. Please feel free to contact Art or Don Burland, CHE Executive Officer, (703-292-4949, dburland@nsf.gov) if you have questions about the review.

The CHE Division Secretary, Cheryl Edmonds (703 - 292-4952, cedmonds@nsf.gov), will contact you shortly with information about making travel and hotel arrangements.

Thank you again for your willingness to participate in this important activity.

Sincerely,

John B. Hunt
Acting Assistant Director

Enclosures: List of Members of FY 2004 CHE COV and excerpt from COV guidelines
cc: Jeanne Pemberton, Chair-designate MPSAC

366. The COV Core Questions and Reporting Template will be applied to the program portfolio and will address the proposal review process used by the program, program management, and the results of NSF investments. Specific questions to be addressed and reported on are:

a) the integrity and efficiency of processes used to solicit, review, recommend and document proposal actions, including such factors as:
    (1) selection of an adequate number of highly qualified reviewers who are free from bias and/or conflicts of interest;
    (2) appropriate use of NSF merit review criteria;
    (3) documentation related to program officer decisions regarding awards and declines, and the scope, duration and size of projects;
    (4) balance of awards in terms of subject matter; emerging opportunities; high risk and innovation; size versus number of awards; new investigators; diversity of underrepresented groups; geographic distribution of principal investigators; and
    (5) overall technical management of the program.

b) the relationships between award decisions, program goals, and Foundation-wide programs and goals;

c) results, in the forms of outputs and outcomes of NSF investments for the relevant fiscal years, as they relate to the Foundation's current strategic goals and annual performance goals.

d) the significant impacts and advances that have developed since the previous COV review and are demonstrably linked to NSF investments, regardless of when these investments were made. Examples might include new products or processes, or new fields of research whose creation can be traced to the outputs and outcomes of NSF-supported projects over an extended period of time.

e) response of the program(s) under review to recommendations of the previous COV review.

The Division of Chemistry held its triennial COV on February 3-5, 2004. The COV comprised 30 members of the chemical sciences community. These individuals were chosen for their scientific expertise and their breadth of understanding of issues impacting the chemical sciences. Collectively, the COV membership represented a variety of perspectives and was balanced across the various sub-disciplines in chemistry. Inclusiveness in the COV membership is illustrated by the committee's geographic, institutional and demographic diversity, as shown below:

Category	**Number**
Member of MPS Advisory Committee	1
Academic Institutional Type	
Research	18
Comprehensive	1
4-Year	3
Public	13
Private	8
Industry	3
Outside the US	1
Government	4
Location	
Northeast	4
East	6
Southeast	4
Midwest	7
Southwest	2
Rocky Mountain	3
West Coast	3
International	1
Female	14
Male	16
Minority	6
No NSF Support in Five Years	8

The COV was briefed on issues of Conflict of Interest for the purpose of one of the COV's statutory responsibilities, namely the reading of proposals, reviews, and recommendations and commenting on the handling of actions and the appropriateness of recommendations. Each COV member completed a NSF Conflicts of Interest form. In addition, COV members were instructed to reveal to all other COV members in the breakout sessions all such conflicts or appearances of conflicts as described in the NSF Conflicts of Interest Manual 10. Proposals and files were not available to COV members in those cases where the member had a conflict of interest. Furthermore, the COV members were instructed to leave the room during discussion of such actions.

The Division of Chemistry believed that the efforts of the COV and the COV Chair, Dr. Robert Silbey of MIT, were outstanding in all respects. The Division staff detected no situations in which conflicts of interest were not handled properly. The Division was pleased with the quality, professionalism, and thoroughness of the COV report and its findings.

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June 24, 2004

Dr. Michael S. Turner, Assistant Director
Directorate for Mathematical and Physical Sciences
National Science Foundation
4201 Wilson Boulevard
Arlington, VA 22230

Dear Michael:

I am pleased to inform you of the formal acceptance of the Report of the Committee of Visitors (COV) for the Division of Chemistry (CHE). Dr. Robert Silbey, Chair of the COV, presented the Report to the MPS Advisory Committee (MPSAC) at its April 22-23, 2004 meeting. The Report was laudatory regarding the effectiveness of the Chemistry Division both in facilitating scientific discovery in chemistry and related areas as well as in the administration of the grant proposal review process. The need for a strong emphasis on single investigator grants that has characterized past CHE funding was noted. The positive impact on the community of CHE funding for instrumentation, especially instrumentation funding for undergraduate institutions, was also noted.

The COV report noted several important issues and opportunities that the MPSAC believes should receive attention. Specifically, the COV noted "the increasing disparity between the average size and duration of individual investigator awards from the NIH and NSF." Concern was expressed that "not only is this disparity driving excellent science out of the NSF portfolio, federally funded chemists are increasingly redirecting their research towards medically-related areas. If this trend continues, critical areas of national need (e.g., chemical and biological sensors, instrumentation), scientific infrastructure and workforce training will be underserved." Although the Division has begun efforts to increase grant duration as a partial solution to this problem, the fundamental limitations imposed by the Divisional budget preclude resolution of this problem in a substantial way. The potential deleterious long-term impact on the discipline resulting from this disparity cannot be overstated.

The COV also commented on the problems of the staff workload imbalance created with a finite proposal submission window, and the need for continued education of the community about the "Broader Impact" criterion for proposal evaluation. With respect to the latter, although CHE has been a leader within MPS in communicating with the community through its "Dear Colleague" letter of 2002, the COV noted the variability in

attention to this criterion in proposal reviews. Thus, the MPSAC encourages the Division to continue its efforts to educate and engage the community on this issue.

Finally, the COV encouraged the Division to "energize the community to take part in the nascent NSF programs in cyber-technology" since "chemistry ought to be a major player in this effort because of [its] strengths in molecular level computation." The MPSAC concurs with this directive.

We are grateful to the COV and its Chair for the excellent, in-depth review of the Chemistry Division, and to the Chemistry Division staff for their thorough preparations for this COV review and for their commendable work.

Sincerely,

Jeanne E. Pemberton
Chair, MPS Advisory Committee

cc: R. Silbey, A.B. Ellis, M. Aizenman