

**National Science Foundation (NSF)**  
**Directorate for Computer and Information Science and Engineering (CISE)**

**CISE Management Response to the**  
**Division of Computing and Communication Foundations (CCF)**  
**Committee of Visitors Report**  
**March 4-5, 2009**

**Introduction**

The Division of Computing and Communication Foundations (CCF) in the Directorate for Computer and Information Science and Engineering (CISE) of the National Science Foundation held a 2-day Committee of Visitors (CoV) review meeting on March 4-5, 2009. The purpose of this meeting was to provide NSF with an assessment of the quality and integrity of CCF program operations pertaining to proposal decision and to comment on how the results generated by awardees have contributed to the attainments of NSF's mission and strategic outcome goals. The CoV review covers the FY 2006 through FY 2008 period.

The CoV consisted of 24 members, selected for their expertise and coverage of the research and education areas supported by the Division. We also sought to ensure that the team reflected the geographical, gender, ethnic, and institutional diversity of the community that NSF seeks to serve. The CoV was organized into 3 subcommittees, reflecting CCF's programmatic orientation during the period of review. Each of the subcommittees was charged with preparing detailed reports on one of the three CCF program clusters, and the CoV as a whole prepared a summary report. The CoV evaluated CCF performance in the context of the CoV criteria provided by NSF.

The CoV members were provided with a comprehensive web site of information relevant to program operations and proposal decisions, including past CoV reports and CISE management responses, a detailed self study report, a random sample of proposal jackets (both awards and declinations augmented with oversampling of jackets with special characteristics), research highlights, and program solicitations. The CoV also heard presentations from and met with the Division Director and several CCF Program Directors during the review meeting. For the duration of the CoV review meeting, CCF staff provided support to the CoV members and responded to requests for data as they arose.

We are grateful and delighted to have been reviewed by such a high-quality CoV. We are especially grateful to the CoV, and in particular the chair, co-chair, and subcommittee chairs, for their dedication, hard work, comprehension, and thoughtful comments about CCF processes and results.

**Overall Performance and Goals**

The summary opinion of the CoV was very positive as evident from this quote from the opening paragraph of the CoV report:

*The CoV review found that CCF is dedicated to meeting its goals and to serving its intended research community. The CoV also found that, overall, the CCF Division is working extremely well, and that aspects in which improvements could be made or processes reconsidered are minor.*

We asked the CoV to comment on the recently-completed realignment of CCF programs. The CoV strongly endorsed the change as evident in this quote from the executive summary of the CoV report:

*Overall, the CoV strongly endorses the reorganization<sup>1</sup> of CCF into the three new clusters: Algorithmic Foundations, Communication and Information Foundations, and Software and Hardware Foundations. In particular, the CoV believes that this may address an issue that challenged CCF for many years, which is that the Theory of Computing area was interpreted rather narrowly. The CoV believes that the new organization of CCF by three broad themes would enable a broader view of foundational research in computing, information processing and communications.*

The CoV split up into 3 subcommittees, one for each of the three (former) program clusters in CCF: Theoretical Foundations (TF); Emerging Models and Technologies (EMT); and, Computing Processes and Artifacts (CPA). The subcommittees developed reports aligned with NSF's CoV template; the reports were divided into Section A dealing with Process, Section B dealing with Results, and Section C for Other Topics. For Section A, all three subcommittees found that the integrity and efficiency of the program's processes and management, the selection of reviewers, the resulting portfolio of awards, and management of the program were generally excellent.

It is clear from the subcommittees' responses to questions in Section A3 and the summarization preceding the selected project highlights quoted in Section B that the CoV believes that CCF is supporting outstanding science and engineering. For example, the CoV states:

*We found the overall quality of the research and education projects supported by CPA to be outstanding. Clearly, the panel system, coupled with the discretion of the program directors, is effective at funding good research.*

The EMT subcommittee found that the entire program was of high quality and was focused on transformative and interdisciplinary projects. The TF and CPA subcommittees also found that the portfolio of funded projects was very appropriate. (If anything, there was a slight concern that the CPA portfolio was too interdisciplinary.) The TF subcommittee also noted that the TF portfolio was of outstanding quality.

All three subcommittees cited numerous reports to demonstrate that CCF programs were responsive to national priorities and needs.

But the subcommittees expressed concern that many high quality proposals were not being funded, due to funding constraints imposed by the total funds available in the Division budget.

The CoV found that CCF was responsive to emerging trends in the research community. This is critical. If CCF is to be successful in supporting transformative research, it is through identifying and supporting the trends that have potential for lasting impact. This will enable the CCF portfolio to remain at the

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<sup>1</sup> While this was called a "reorganization" in the CoV report, it was, in fact, a realignment of programs within CCF since we did not alter the organizational structure.

frontier. The CoV report endorsed CCF efforts in this regard; we interpret this endorsement as encouragement to continue to fund exciting, emerging areas related to core CCF areas. One such area being explored right now is research at the interface of computer science and economics, where we feel there is a critical mass of exciting research and researchers to warrant more targeted investments.

The CoV Report contains a number of important comments, concerns, and suggestions to which we respond below.

We begin by addressing points made in the executive summary (in sequence) and then respond to points from the individual subcommittee reports if they were not addressed in the executive summary. Since all three subcommittee reports used the standard NSF CoV template, we use notation such as 'CPA A1/5' for example, to refer to the CPA subcommittee response to Question A1/5 in the standard template.

### **Comments from the Executive Summary:**

**1) Programs in EMT:** CCF realigned its programs at the start of FY '09. Although this was outside the period of the CoV's review, we specifically solicited their opinion on this change. The CoV strongly endorsed it, (Section 1A3 of the CoV Report). However, the COV raised concern about the disposition of programs in the erstwhile EMT program. The CoV was concerned about maintaining cohesion in each of the areas of: biocomputing, nanocomputing, and quantum computing. The CoV also suggested that these areas be treated as crosscutting areas across NSF. The EMT report also notes that some of the proposals in this program might have ideally been reviewed by more than one panel (EMT A1/1). It also notes (EMT A4/1) that the realignment could have been better communicated to the research community.

**Response to 1):** The EMT program brought together disparate research communities in bio, nano, and quantum computing. The main goal of the realignment was to situate these research activities in programs that would result in better-defined research foci. We believe, and the CoV agreed, that this was a worthy goal that has been accomplished through the realignment. For example, nanocomputing and biocomputing activities are supported in the Software and Hardware Foundations (SHF) program, since CISE research in these areas is largely about building primitive computing components and putting them together in computing systems. On the other hand, CISE research in quantum computing emphasizes the areas of algorithms and complexity, and hence quantum computing is now placed in the Algorithmic Foundations (AF) program. EMT also included research on communication in quantum and biological systems and these have appropriately been placed in the Communication and Information Foundations (CIF) program.

We agree with the EMT subcommittee's statement (EMT A1/3):

*There seemed to also be some variance in the quality of the reviews and ratings depending on the reviewer's discipline -- the reviewers from non-CISE disciplines tended to rate proposals higher than the reviewers from CISE disciplines. This may be due to differences between disciplines (average scores in other disciplines tend to be higher than CISE), but in some cases also appeared to be due to the reviewer paying greater attention to the non-computational aspects of the work. This may be natural given their background, but in proposals that will be fully funded from CISE, it is important that there be some potential CISE contributions. In situations where this is not the case, program directors should consider seeking co-funding of the proposals with appropriate partners.*

In fact, we have comprehensive plans in place to expand collaborative interactions and reviews in the quantum and bio-computing areas. For example, Dr. Tatsuya Suda, a CCF Program Officer, has been instrumental in establishing a stronger relationship with colleagues in the Directorate for Biological Sciences to facilitate co-review and co-funding of projects in the bio-computing area. Dr. Dmitri Maslov, a CCF Program Officer, has been working closely with colleagues in the Directorate for Mathematical and Physical Sciences to facilitate the creation of a new program in Quantum Information Science.

To better communicate the impact and consequences of CCF's program realignment to potential PIs, we will release a Dear Colleague Letter to the CISE community this Fall (Fall of 2009).

**2) Data about individual program areas:** The Executive Summary and the CPA report (CPA A3/6) recommend better tracking of expenditures, proposal success rates, award sizes, etc, for each research area within the CCF programs rather than at the macro level of a program cluster (for example, the Architecture and Software Engineering research areas were supported in the Computing Processes and Artifacts program cluster). The CPA subcommittee recommended better monitoring of funding to specific areas such as architecture and hardware-oriented areas in general. This subcommittee also wanted to ensure that funding to these areas did not suffer as software engineering investments become a CCF priority.

**Response to 2):** We have taken steps to ensure that we can monitor spending and award sizes at the research area level. In FY '09 we funded awards out of specific program element(s) rather than from a program cluster account when possible. This allows us to track budget allocations to each area and other related data (e.g. average award size) on an area-by-area basis. We intend to continue having in place the mechanisms that allow such tracking. We will also explore the workload implications of tracking success rates on an area-by-area basis.

**3) Crosscutting programs:** The CCF CoV suggested that separate CoV(s) be constituted to evaluate crosscutting programs in which CISE participates.

**Response to 3):** NSF does host CoVs for specific crosscutting programs, such as CDI, IGERT, and CAREER, where the scope and scale of the program merits a separate review. Since crosscuts within CISE are often of limited duration, CISE prefers to review these programs within the Divisions charged with their stewardship. So, for example, the Cyber Trust program is overseen by CNS, and is reviewed by the CNS CoV, even though Cyber Trust is a cross-cutting program with Program Officer support from all three CISE divisions. It is incumbent upon CISE management to ensure that CoV members on the Cyber Trust subcommittee have the span of expertise necessary to adequately review the program, and the Cyber Trust proposals and awards sampled in the CoV review process include Cyber Trust awards managed in divisions other than CNS. This strategy avoids the needless proliferation of CoVs.

**4) Award sizes: (Also CPA A3/3, EMT A3/3, TF A3/3, CPA A3/6, EMT A3/6)** The COV expressed the concern that award sizes were not large enough to fund truly transformative research. It also pointed to an apparent lack of consistency in cutting budgets on collaborative proposals. To quote the report, *"The CoV noted lack of consistency in the budgeting of collaborative proposals. The impression is that proposals where both collaborators are in the same institution undergo more severe budget cuts than collaborative proposals where the collaborators are in different institutions. The CoV recommends for CISE to develop consistent guidelines for the review and budgeting of collaborative proposals."*

**Response to 4):** All three of CISE's CoVs expressed concern about reductions made by Program Officers in requested budgets. As in the other two management responses, we note that proposal pressure within our programs leads Program Officers to have to make hard choices. In some cases, awards are indeed made with significant cuts in the requested budgets. Program Officers reduce budgets for a variety of reasons, including: removing items from a proposed budget that are not ultimately justified for the proposed work (for example, excessive travel); modifying the scope of work in response to reviewers' comments or concerns (such as, to eliminate a weaker element in a proposed project); and seeking equity across awards by funding similar projects at similar levels (such as amount of graduate student or faculty support). Program Officers invest considerable thought in this exercise, since they are aware that freeing up funds on one project may ultimately enable another project to be supported.

This said, we are wholly committed to ensuring that budget reductions are not harmful to the scientific value, including the transformative potential, of the projects we support. Consequently, CCF will adopt a practice already proving effective in our sister division, the Division of Information and Intelligent Systems, by asking Program Officers to report the rationale for budget cuts of more than 10% in their Review Analyses. This will encourage greater reflection on the potentially negative impact of budget reductions, and will provide enhanced transparency at the Program Director, Program Cluster, and Division levels, thereby allowing for continuous monitoring and, where necessary, adjustment.

After examining proposal and award data, we have found no systematic inconsistency in funding collaborative proposals, where, as the CoV sees it, proposals from one institution have their budgets reduced more severely than proposals from multiple institutions. Collaborative awards involving multiple institutions were sometimes cut, on occasion resulting in some PIs not getting any funding. Similarly there was a range of budget cuts in multiple investigator awards to a single institution. It is hard to infer any definite pattern in these cuts. We will pay due attention to this issue as we make collaborative awards by applying the practice described in the previous two paragraphs of asking Program Officers to report the rationale for budget cuts of more than 10% in their Review Analyses.

With respect to making larger, more transformative awards, CISE has created an **Expeditions in Computing** program that makes \$10M awards. In addition CCF and the other Divisions are incentivizing Program Officers to fund larger awards by providing division matching funds for such awards. The average award size is not as high as we'd like to see, but our average award size trends indicate that we are indeed moving in the right direction (i.e., average award sizes are increasing).

#### **Comments on the Review Process:**

The overall opinion of the CoV on the review process is expressed in the opening sentence of this section, quoted below.

*Overall, the CoV believes that the review process is excellent and results in high-quality funding decision making. It is also clear from the jackets that the PDs do not shy away from exercising their discretion and judgment in pursuing high-risk high-payoff proposals.*

However the CoV noted the following concerns.

**5) Guidelines to reviewers and PI's (Also CPA A1/2, A1/3, EMT A1/2, TF A1/1, TF A1/2, TF A1/3):** The CoV found that the lack of written guidelines for reviewers leads to great variation in the interpretation of the NSB merit review criteria and the informativeness of the reviews. The CoV noted that standard

templates such as those used in conferences could be used to elicit more informative reviews that also help PIs improve their (declined) proposals. Specifically, with respect to the Broader Impacts criterion the CoV felt (CPA A1/2, EMT A1/2, TF A1/2) that there was great ambiguity of interpretation. The COV also felt that NSF could help PIs by suggesting ways of addressing this criterion in their proposal and help reviewers by suggesting ways of evaluating it.

**Response to 5):** This concern was similarly expressed in the other two CISE CoVs. CISE is committed to improving the quality of its review process. To encourage the reviewer community to provide more substantive reviews, our Program Officers consistently try to impress upon our reviewers that they should provide detailed reviews that describe both the strengths and weaknesses of the proposals being considered. Furthermore, Program Officers strive to educate panelists to ensure that panel summaries address NSF review criteria and are clear in their justification of the panel recommendations, particularly when inconsistencies exist in the individual reviews. CISE will continue to explore new ways to ensure that panelists' reviews and panel summaries provide meaningful feedback to PIs.

Ensuring that PIs and reviewers consistently address broader impacts in their proposals has been an ongoing challenge in the agency as well as in CISE. Although NSF and CISE have provided the community with access to information about Broader Impacts, including representative examples that can be accessed from CISE solicitations <http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>, and despite the fact that at every CISE panel meeting reviewers (who are invariably PIs themselves) are briefed on the importance of addressing Broader Impacts in their review of proposals, we see inconsistent attention to Broader Impacts in CISE proposals and reviews. Of course, we remain committed to helping the community respond more effectively to this important merit review criterion. In FY 2010, CISE will publish a Broadening Participation in Computing Strategic Plan that amongst other things, will provide CISE PIs with access to resources and ideas they can leverage to better address NSF's Broader Impacts criterion. Furthermore, we plan to build on the success of several NSF-led broader impact initiatives, such as the [Broader Impacts Showcase](#) organized by the Division of Chemistry of the Mathematical and Physical Sciences Directorate and other similar initiatives in diversity and broadening participation organized by the Engineering Directorate to explore new ways to educate the community about broader impacts and allow principal investigators to discuss and engage in a wide range of broadening activities that can enrich CISE's sponsored research portfolio.

**6) Two scales for proposal evaluation: (Also EMT A1/1, TF A1/4)** The CoV noted that when providing individual reviews, reviewers use the standard NSF quality scale ranging from 'Excellent' to 'Poor' and that after the panel discussion, proposals are classified on a different (2 to 4 point) scale ranging from 'Highly Competitive' to 'Not Competitive'. The CoV expressed concern that there is ambiguity in the minds of Program Officers and reviewers about whether the latter is a quality scale or a scale constrained by available funding. The CoV advocates that the panel produce a pure quality scale leaving it to the Program Officers to decide on funding.

**Response to 6):** The existence of the two scales gives the panel and Program Officers an opportunity to recalibrate the 'raw' individual quality ratings of "Excellent" through "Poor" into ratings that place proposals in their peer groupings of "Highly Competitive" to "Not Competitive." In the last two years this latter scale has *not* been funding-conscious in CCF. However, considerations such as Program Officer workload, and a desire to provide realistic feedback to the PI community about the current funding context, make it difficult to completely eliminate the influence of funding likelihood on the second scale. We will continue to ensure that even if the second scale is somewhat funding-conscious, the quality of the proposals in a panel is clear in the panel recommendations.

**7) Better software: (Also CPA A1/1, EMT A1/1, EMT C3, TF A1/1)** Throughout the report the CoV points to the existence of much better software tools and database systems for managing reviewers' areas of expertise, conflicts of interest, reviewer assignments, etc. They note that such tools are used for conferences and journals and recommend that NSF consider improving its software systems with such tools.

**Response to 7):** Efforts are underway in the agency to create a reviewer database with just this kind of information. This is part of NSF's Business Applications improvement strategy, and CISE is positioned to provide input and feedback that informs implementation of this strategy. Further, CISE has established a Just Use IT committee to encourage Program Officers to try new technologies that will facilitate the review processes. In addition, CISE and SBE have established a Subcommittee of their Advisory Committees to identify a range of technologies that can assist in analyzing and visualizing a given set of proposals. The recommendations from the Subcommittee will be considered by CISE and the Divisions to determine a feasible technology approach. Such outcomes would not only impact the review process, but program management more generally.

**8) Sharing best practices among PDs:** The CoV notes that new Program Officers should be mentored by more experienced Program Officers and that CCF should create a 'manual' of best practices.

**Response to 8):** This issue also was raised by all three CISE CoVs. We have already adopted a mentoring system in CCF. Beginning in FY '09 each new Program Officer has been assigned a mentor. Beyond this, Program Officers have many opportunities for interaction and a new Program Officer learns the ropes in conversations in the corridor or over lunch as well as by sitting in on panels and helping with review analyses written by more experienced colleagues. The idea of creating a manual of best practices is an interesting one. We will start creating such a manual at the CCF retreat and we'll leverage the experience of our sister divisions in doing so.

**9) More lead time for panelists:** The CoV correctly points to cases where panelists have been invited to serve on panels less than a week prior to the panel meeting. The integrity of the review process warrants better lead times.

**Response to 9):** We completely agree with the CoV that adequate time should be provided to panelists to prepare thorough reviews and we endeavor to do so. Within the 6 months allocated for merit review, proposals must first be sorted into panels, conflicts of interests managed, and reviewers selected. In our timetable for proposal processing, this allows three to four weeks between the constitution of a panel and its meeting date. Occasionally, due to the need to replace panelists at the last minute, or the difficulty of scheduling a panel because of non-availability of rooms, this best practice is not met. Program clustering, which we instituted about five years ago, accentuated such issues. However, over time, we have been implementing practices to mitigate these issues, and we expect to further improve our practices using our accumulating experience.

**10) Problems arising from consolidated submission deadlines:** The CoV noted that CISE moved to common deadlines for core and crosscutting proposals across the Directorate in FY '08. All small proposals are now due in December, all mediums in August, and all larges in November. The CoV weighed the pros and cons of this change and made a few suggestions, such as spreading out the deadlines more in the year, separating deadlines for core and crosscuts etc.

**Response to 10):** There are many factors driving us towards closely synchronized proposal submission deadlines. Such deadlines allow us to transfer proposals to the most appropriate program/panel. Further, since funding decisions in one program may affect decisions in other programs, a long lag between proposal deadlines often has an adverse impact on proposal dwell time and PI customer service. Limitations imposed by the federal budget cycle also influence our program solicitation strategy. In transitioning to annual submission deadlines, we undertook a comprehensive analysis of all of these factors and others (e.g. the submission deadlines for other NSF programs) to try to identify an optimal (but certainly imperfect) program solicitation approach. We hope that the approach we have adopted will provide our PI community with a sense of stability, allowing them to internalize the CISE proposal submission calendar and plan ahead for their proposal submissions. We are therefore hesitant to make additional changes at this time.

**11) Explicit statement about renewal grants (Also TF A4/5):** The CoV recommended that CISE make clear that the organization is no longer awarding renewal grants, a policy that seems to be implicitly followed.

**Response to 11):** In fact, this is not true and hence CISE will not make such a statement. CISE does accept renewal proposals, which are given due funding consideration as are all other proposals. While we do not receive many such proposals we will ensure that Program Officers and reviewers evaluate them appropriately. However, it is fair to say that renewal proposals may not review as positively as other proposals in the merit review process, mostly because competition for funding is so intense, and CISE reviewers tend to favor new and innovative proposals that present novel ideas and directions, rather than renewal proposals which may appear more incremental.

#### **COV Process and Response to Prior COV:**

**12) Advance preparation + data (Also CPA A4/4, EMT A4/4):** The CoV complimented CCF on the preparation of a detailed self-study report but noted that more data were needed to answer some of the questions on the NSF CoV template. The CoV also requested more lead time to review the self-study ahead of the visit and requested more planning meetings prior to the CoV meeting itself. They also asked for access to comparative data across CISE, other Directorates and NSF, and requested access to more interim and final reports.

**Response to 12):** These are very valid and helpful points. Each of the three CISE CoVs held this year commented on the longer lead time needed to better prepare CoV members to meet their challenging charge. CISE takes this feedback seriously, and accordingly will make significant adjustments in its CoV planning process. CISE very much appreciates the CoVs' hard work and perceptive analysis and will do everything in its power to make the CoV process both more effective and more rewarding for CoV members.

**13) Reviewer self-assessment of confidence in review (Also in CPA A2/1, EMT A2/1, TF A2/1, and TF A4/4):** This point probably belongs in the comments on review process. However, it is here because it was suggested by the previous CoV and CCF in its response promised to consider it seriously. The CoV (again) recommends that, as in conference and journal reviews, reviewers assess their own expertise and confidence in the review they are providing, using numerical scores. The CoV notes that this would inform Program Officers when additional reviews might be required.

**Response to 13):** Most Program Officers already ask panel members to self-assess their interest and expertise on each proposal before assigning reviewers to proposals. We will make this a standard part of our process in the future.

**14) Openness:** The CoV advocates that all full proposals that are funded become public documents (perhaps after some redactions) after the expiration of the project period.

**Response to 14):** NSF has been moving towards greater openness. As required by the America Competes Act of 2007 all NSF-funded projects must now submit final reports that will be made public on Research.gov. However at this time, NSF has no plans to make proposals public documents.

#### **Comments Specific to Clusters:**

##### **CPA:**

**15) Dwell time (CPA A1/7):** CPA dwell time statistics during the CoV period were below the NSF goal of 70% of proposals DD concurred within six months of receipt/deadline.

**Response to 15):** During the CoV review period, the CPA program had deadlines such that the six month window ended at a point in the fiscal year when funding levels were still uncertain. This made Program Officers hold on to many proposals for longer than six months. With the revised, consolidated deadlines this problem is mitigated.

**16) Insufficient data on reviewer demographics (CPA A2/2. Also in EMT A2/2 and TF A2/2):** All three CoV subcommittee reports state that they are unable to comment on reviewer demographics because only about 25% of reviewers reported demographic data. The subcommittees recommend that NSF impress upon reviewers the importance of reporting these data.

**Response to 16):** Program Officers will advise panelists of the importance of providing this information when they charge panels.

**17) Awards to new investigators (CPA A3/7, EMT A3/7):** Slightly different concerns were raised by the CPA and EMT subcommittees. The CPA subcommittee saw trends (within the three-year period) that showed number of proposals from and success rates of new PIs going down, but they thought that the numbers looked reasonable overall. They wanted to see longer-term trends. The EMT subcommittee felt that more EAGER and RAPID (formerly SGER) awards should be given to new PIs.

**Response to 17):** We have longer term trends (as sliding 3-year windows). Success rates on proposals by new investigators was 19.7% in CCF in 2001-03, dipped to 15.2% in 2003-05 and is back up to 19.7% for 2006-08. Looking at success rates for new investigators (rather than individual proposals they submit) the rates are much better and reached 29.7% in 2006-08. Success rates started out at 28.6% in 2001-03 and dipped to their lowest point of 22.9% in 2003-05. The numbers compare well with success rates over the same period in all of NSF and in CISE.

CISE did better than other Directorates in giving EAGER and RAPID (formerly SGER) awards to new investigators. We will continue to look for situations when such awards to new PIs are appropriate.

**18) Underrepresented minority PIs (CPA A3/11):** The CPA subcommittee found that the numbers and success rates of investigators from underrepresented minority groups could be improved. (The other two subcommittees note this too, but don't see a difference between CCF statistics and the general picture in the research community in CISE.) In general, the CoV noted that the situation is better for women than for minorities.

**Response to 18):** It is important to take a bottom-up approach here and efforts need to be given high priority by the entire CISE community. We need more members of underrepresented minority groups majoring in CISE topics, going on to graduate school, entering academic careers, and submitting high-quality proposals to CCF. CCF will continue to encourage this by providing REU supplements, graduate student support etc. for qualified students from underrepresented minority groups. In addition our Program Officers undertake outreach activities targeted at underrepresented minority PIs and will continue to do so. The BPC program is specifically targeted to outreach and CPATH supports such efforts as well.

**EMT:**

**19) More S&E travel support (EMT A4/3):** The COV indicated that the CISE S&E budget is woefully inadequate to support the travel needs of Program Officers who are federal employees or Visiting Scientists and Engineers, noting that NSF Program Officers need to be able to travel to site visits, outreach events, conferences and workshops, as well as to conduct Independent Research and Development activities.

**Response to 19):** This concern was also expressed by the CNS and IIS CoVs. And indeed, CISE shares the CoV members' concern about travel budget constraints and their impact on the directorate's responsibility to provide effective award management, to conduct effective outreach to underserved populations, and to provide professional development and enrichment opportunities for our staff to ensure they remain knowledgeable about the science and engineering frontier. Unfortunately however, funds available for award management, outreach, and professional development and enrichment are limited by Congressional appropriations, making it necessary to prioritize among very worthy competing organizational needs. Our records do show that CISE Program Officers are able to attend at least two professional meetings each year. However, this will become an increasingly challenging norm to attain because as CISE continues to increase the number of larger projects it supports (such as the Large Core-Programs awards and Expeditions awards); thus project management and oversight resource needs increasingly compete with the need to send Program Officers to professional meetings. NSF and CISE management remain committed to making a strong case to the Congress that the appropriation of adequate funds for travel that permits effective project management, outreach, and professional enrichment is essential to NSF's mission and to the effective management of the organization

**TF:**

**20) Better recording of "corner cases" (TF A1/1):** The subcommittee recommended that Fastlane, eJacket, and other systems be augmented with better ability to cope with and record "corner cases" such as when a PO recommendation goes against panel sentiments or when a DD declines to concur with a PO recommendation. Also, the CoV recommends that in cases where *ad hoc* reviews are used, these should be recorded as such in eJacket. Similarly, the CoV noted that reviews from site visits need to be recorded.

**Response to 20):** In fact, eJacket documentation records which reviewers participate in a panel and which reviewers participate by providing a mail review. EJacket records also reflect when a Program Officer does not follow a panel recommendation. However, there is no way in e-Jacket to search for the proposals in which this is the case. We interpret the CoV's recommendations to mean that they would like to see a searchable database that allows an interested party to identify the proposals in which this is the case. We will make this recommendation to the eJacket requirements group who inform the creation of new functionalities in eJacket.

**Miscellaneous Issues:**

**21) Units of effort:** The CoV also recommended that proposal categories be based not on proposed budgets but on levels of effort.

**Response to 21):** We are also conscious of units of effort. In fact, the Cyber-enabled Discovery and Innovation (CDI) competition distinguishes between Type I and Type II proposals based on units of effort. CCF scientific staff will be especially cognizant of minimum thresholds of effort when cutting budgets on awards.

**22) Funding per PI:** The COV also recommended that we initiate a study of funding per PI rather than per proposal.

**Response to 22):** Studying funding per PI will be difficult, given the difficulty of identifying budget shares in collaborative proposals and in awards from other agencies.

**23) Single PI and Multi-PI Awards:** Finally, the COV suspected, but was unable to determine whether the balance between single-PI and multi-PI awards was tilted too far in the direction of single-PI projects.

**Response to 23):** We expect that with the push to funding larger awards, the balance between single-PI and multi-PI awards will also improve.

**Conclusion:**

The COV raised a number of issues, some of which are already being addressed. For others we have either justified the current practice in CCF/CISE/NSF or described a plan to correct the situation.

The overall tone of the report is very supportive of the projects supported by CCF and the processes that CCF follows in arriving at its decisions, ensuring a diverse PI and reviewer community, and responding to new trends. We will aim to build on our strengths and nurture a vibrant research community in the areas of computing and communication foundations.