ITR COV Table of Contents
September 8, 2005

Subject: Conveying the ITR COV Report
To: pfreeman@nsf.gov
Cc: jcollins@asu.edu, Alfred Z Spector <aspector@us.ibm.com,
<mji@cse.psu.edu, jbrighto@nsf.gov, mleinen@nsf.gov,
mturner@nsf.gov, weward@nsf.gov, mclutter@nsf.gov, katehi@purdue.edu,
rdetrick@whoi.edu, wcl@jila.colorado.edu, bgroves@isr.umich.edu
From: Alfred Z Spector <aspector@us.ibm.com
Date: Wed, 16 Mar 2005 14:16:23 -0500

Peter et al,

It is my pleasure formally to convey the Committee of Visitors Report on the ITR Program, chaired by Mary Jane Irwin.

There are four parts to it, beginning with the file named FY2005 EX SUMMARY COV_ITR.DOC
They need to considered as a whole.

Representing the CISE Advisory Committee, we look forward to your comments at the April Advisory Committee meeting.

(See attached file: 2001 TEAM COV_ITR.doc)(See attached file: 2002 TEAM COV_ITR.doc)(See attached file: 2003 TEAM COV_ITR.doc)(See attached file: FY2005 EX SUMMARY COV_ITR.doc)

Sincerely,

Alfred Z. Spector
Chair, CISE Advisory Committee

Vice President, Software
IBM Research Division
19 Skyline Drive
Hawthorne, NY 10532
phone: 914-784-7504 (IBM t/l 863)
fax: 914-784-6147
aspector@us.ibm.com
Asst.: Shirley Skidmore

FY 2005 ITR COMMITTEES OF VISITORS (COVs) REPORT

Date of COV: March 8, 9, 10, 2005	
Program/Cluster: Information Technology Research Priority Area	
Division:	
Directorate: BIO, CISE, EHR, ENG, GEO, MPS, OPP, SBE	
Number of actions reviewed by COV[1]: Awards: 181 Declinations: 164 Other:	
Total number of actions within Program/Cluster/Division during period being reviewed by COV[2]:	**Awards: 1165 Declinations: 4724 Other:**
Manner in which reviewed actions were selected: Self-selected by COV reviewers from random sample provided by NSF	

The COV for the Information Technology Research (ITR) priority area was composed of three co-chairs and three teams, one team for each of years 2001, 2002, and 2003. The teams reviewed jackets from their assigned year as well as the solicitation, management plan, work plan, reviewer guidelines, etc. for that year.

The report is composed of four sections. The first section contains executive summaries, written by the three co-chairs, for each of Parts A, B, and C compiled from comments and observations made by the review teams for 2001, 2002, and 2003. Next the individual COV reports for each of the three years written by the teams for those years is included. Finally, the Appendix contains the Data Tables & Graphs compiled by NSF staff that were available to the COV members for developing their reports and their conclusions.

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.

Executive Summary of Part A

In general the integrity and efficiency of the program's processes and management were viewed to be appropriate, a complement to NSF staff, considering that the requirements of a new, interdisciplinary, cross-directorate program presented numerous of process-oriented challenges. It is clear from a review of the reports of the individual teams that progress was made in addressing these challenges over the three years evaluated. The summary template attempts to synthesize the individual years

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

COV teams' responses. If there was a concensus of positive responses, a positive response is provided in the summary template and no comments are made. If there was a concensus of negative responses, the summary template presents a negative response with a brief comment addressing the concern. If there were mixed responses, the majority response is offered in the summary and a brief comment is made to reflect the concern. The executive summary highlights several high-level issues that appear to be ubiquitous across the years; detailed comments specific to a particular year are maintained in the individual year reports.

The size and interdisciplinary nature of ITR proposals challenge NSF's traditional review and oversight procedures. The panels were required to be broader than usual, the proposals incorporated components (research, infrastructure, education, dissemination) which require different evaluation models, and the medium and large-scale proposals require a greater degree of management and accountabililty. Given the breadth of the community involved it is difficult to assemble a strong, diverse, and conflict-of-interest-free pool of reviewers. While great efforts were made to ensure a sufficient number of appropriate reviewers, there was a general concensus that an increased use of quality mail reviews would have been beneficial. Additionally, the sheer volume of proposals combined with the lack of NSF staff assigned to the ITR program led to some concern about the level of feedback provided to Principal Investigators.

One of the most consistent concerns expressed within the context of process and management was the inconsistency of proposers, reviewers, panels and NSF Program Directors, in addressing **both** merit criteria and in particular, the broader impact merit criterion. This problem was most serious with respect to the small proposals and represents a Foundation-wide concern that goes well-beyond the ITR program. While the Foundation has worked hard to help define what is meant by "broader impacts'", there are still widely varying interpretations that often lead to confusion in the review process. Within this context many on the team considered it critical to emphasize the importance of extending the definition of this review criteria to include the need for broader participation of under-represented groups.

Two important aspects of the ITR program -- its interdisciplinarity and its openness to high-risk research -- set it apart from other programs, but also present particular challenges to the review process. Within the context of the review process, we must seek more formal means (metrics) to evaluate the "high-risk/high payoff" nature of a proposal as well as to separate those proposals that are truly interdisciplinary from those that merely offer lipservice to this goal. These metrics need to be provided to reviewers, panel members and Program Directors so that a clear set of criteria are established under which to evaluate these ITR-specific aspects of project review.

Finally, the relatively large-scale nature of some ITR projects appeared inconsistent with the level of evaluation and oversight given them. Considering the funding associated with many of the medium and large awards, it was felt that management plans should be required (this was encouraged, but not required in 2002 and 2003), that clear timelines and metrics of success be established and linked to these management plans, and that these timelines and metrics of success be used for oversight during the lifetime of the project. It was recognized that given the innovative and broad-based nature of the ITR program, it may be difficult to establish a single, overarching set of success metrics that would be applicable to all programs. Instead it was suggested that the metrics of success for a particular program be established by the PI, in consultation with the Program Director, after a grant is awarded.

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]**
1. Is the review mechanism appropriate? (panels, ad hoc reviews, site visits)	YES
2. Is the review process efficient and effective? Comments: All groups agreed on effectiveness - one group (2003) had concern about efficiency of process	YES
3. Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines?	YES
4. 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: Two of the three teams concluded that reviews did provide sufficient information though there was concern that the information provided in the jackets did not allow this question to be assessed properly (2003). The 2002 team felt that many proposals had insufficient numbers of informative reviews, with many reviews lacking depth /substance or context. It is often unclear to them (2002) from the information provided in the jacket why a proposal was declined or awarded.	YES
5. Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments: Again two of the teams felt that the summaries provided enough information but the 2002 team felt that many proposals had insufficient numbers of informative summaries lacking depth /substance or context. It is often unclear to them (2002) from the information provided in the jacket why a proposal was declined or awarded.	YES

[3] If "Not Applicable" please explain why in the "Comments" section.

6. Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: Two of the teams expressed concern that the Review Analysis is highly variable across jackets and that many use "boiler plate" language and contain little substance. The third team replied in the affirmative but still expressed concern over undocumented actions.	NO
7. Is the time to decision appropriate?	YES
8. Discuss any issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures: See Executive Summary and individual year reports.	

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (<u>intellectual merit</u> and <u>broader impacts</u>) 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[4]
1. Have the individual reviews (either mail or panel) addressed both merit review criteria? Comments: Intellectual merit is uniformly well-evaluated but reviews are variable in their depth and detail. "Broader impacts" and their relationship to the ITR mission were often omitted including discussion of diversity, education, and outreach. An improvement in the the level of response to "broader impacts" was noted from 2001 to 2003 but by 2003 30% of the reviews still did not address the "broader impact" criteria. This improvement is reflected in the positive answer provided to this question by the 2003 group (though some concern was still expressed about the lack of attention to broader impact).	NO

[4] In "Not Applicable" please explain why in the "Comments" section.

2. Have the panel summaries addressed both merit review criteria? Comments: Again an improving trend but still about 30% of of panel summaries did not address "boader impact" criteria by 2003. The improvement is reflected by the 2003 group's positive response to this question (again with concern expressed about the lack of attention to broader impact).	NO
3. Have the *review analyses* (Form 7s) addressed both merit review criteria? Comments: There is some variability across the large, medium and small proposal review analyses with most of the analyses for the large proposals addressing both criteria but a much smaller percentage of the medium and small proposal review analyses addressing both. All years expressed concern over this item but the 2003 team still answered in the affirmative.	NO
4. Discuss any issues the COV has identified with respect to implementation of NSF's merit review criteria. See Executive Summary and individual year reports.	

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**[5]
1. Did the program make use of an adequate number of reviewers?	YES
2. Did the program make use of reviewers having appropriate expertise and/or qualifications?	YES

[5] If "Not Applicable" please explain why in the "Comments" section.

3. Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: The year teams each differed in their response to this question but there was a general concensus that this question was difficult to answer based on the information provided in the jackets.	INSUFFICIENT DATA
4. Did the program recognize and resolve conflicts of interest when appropriate?	YES
5. Discuss any issues the COV has identified relevant to selection of reviewers. See Executive Summary and individual year reports.	

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[6], OR DATA NOT AVAILABLE
1. Overall quality of the research and/or education projects supported by the program.	APPROPRIATE
2. Are awards appropriate in size and duration for the scope of the projects? Comments: While two of the teams provided clearly positive responses to this question the third (2002) found it difficult to judge based on the the information provided.	APPROPRIATE
3. Does the program portfolio have an appropriate balance of: Comments: Again two of the teams found there to be an appropriate balance of high risk projects but one team (2002) felt that less than 25% of the projects that they reviewed were deemed high risk.	APPROPRIATE

[6] If "Not Appropriate" please explain why in the "Comments" section.

4. Does the program portfolio have an appropriate balance of: • Multidisciplinary projects?	APPROPRIATE
5. Does the program portfolio have an appropriate balance of: • Innovative projects?	APPROPRIATE
6. Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals?	APPROPRIATE
7. Does the program portfolio have an appropriate balance of: • Awards to new investigators?	APPROPRIATE
8. Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments:	APPROPRIATE
9. Does the program portfolio have an appropriate balance of: • Institutional types?	APPROPRIATE
10. Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments: Two of the teams agreed that there was an appropriate balance of projects that integrate research and education though one of these (2001) would like to see more integration between the research and education activities. One group (2002) felt that there should be a larger emphasis on interdisciplinary education.	APPROPRIATE
11. Does the program portfolio have an appropriate balance: • Across disciplines and subdisciplines of the activity and of emerging opportunities?	APPROPRIATE
12. Does the program portfolio have appropriate participation of underrepresented groups? Comments: There was ubiquitous concern about under-represented groups in the ITR program but there was frustration over the inability to properly document the issue based on the information provided in the jackets.	INSUFFICIENT DATA

13. Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports.	APPROPRIATE

14. Discuss any concerns relevant to the quality of the projects or the balance of the portfolio. See Executive Summary and individual year reports.

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

1. Management of the program.
2. Responsiveness of the program to emerging research and education opportunities.
3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.
4. Additional concerns relevant to the management of the program. Comments: All summaries items regarding program management are addressed in the Executive Summary of Part A.

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.

EXECUTIVE SUMMARY OF SECTION B

Section B addresses outcomes for the NSF program goals of People, Ideas, Tools and Organizational Management. Information on these topics was gathered for three years of the ITR program 2001, 2002, 2003 from a variety of sources. In two sessions, a total of eleven NSF program directors presented nuggets followed by two hour-long poster presentations containing 55 posters. The program directors managing the awards were available during the poster session to answer questions about the projects by the COV members. Also, outcomes in the form of 55 nuggets were provided to reviewers on the COV web page. Finally, interim and final reports included in the jackets contain information used in this assessment.

Over the three years, there remained some concerns about diversity in students, panelists/reviewers, and project leadership/participants. However, the representation in percentages of women and minorities generally reflects the current computer science pool (and in some years and program representation is slightly larger than the pool), but the numbers are still small. In order to assess broadening of the community, the program needs to better define the current state and what would constitute success in this area. NSF, through the funding and success of ITR, has helped to legitimize a component of the computer science community that has been interested in applications and that has not always found a home in traditional computer science departments.

Many “best of breed” ideas were enabled by ITR and are included in each year’s detailed reports. Overall, ITR has fueled new interdisciplinary NSF areas that may have existed informally in academic circles. For example, bioinformatics and geoinformatics became formal NSF areas. ITR encouraged community building by researchers since they were required to reach across institutional and departmental boundaries to build their interdisciplinary, multi-institutional teams. In addition, as a cross-directorate program, ITR initiated community building across NSF directorates and program directors. It is critical to capture lessons learned from this process so that the NSF institutional memory remains.

Tools were an important outcome of the ITR program. Many of the tools developed with ITR funding will have very broad impacts nationally and internationally and provide opportunities for users who were not involved in the project. For example, many of the grid and data repository and visualization systems (noted in the individual year reports) will be accessible to users remotely and provide tools, data comparisons and analyses on the cutting edge of their fields. Questions remain as to how the impacts of these tools will be evaluated and how these facilities will be maintained after ITR. Furthermore, broad accessibility, now and into the future, should continue to be addressed.

Over the three years, the management of the program has reflected the lessons learned from implementation of a complex and different type of program structure at NSF. ITR was a large inter-directorate program for which no broadly defined model existed at NSF. Nonetheless, representatives from all directorates were involved with the proposal preview process, and CISE was the responsible for the initial processing of the proposals. In 2001, more concerns were noted about management (see individual years texts), but problems seemed to have been addressed in the out years. Furthermore, NSF has hired and committed to a 5 year, ~$15M professional Business Analysis Study (Booz Allen Hamilton) and will use their recommendations to assess and optimize NSF wide business practices. It is critical to retain those lessons learned past the duration of the ITR funding period.

Finally, if PART questions are to be addressed as part of the COV they should be included explicitly in the template. While the COV co-chairs reminded the Teams to include the two PART questions in their report, in the end only one team did so.

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 <u>OUTCOME GOAL for PEOPLE</u>: Developing “a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens.”

Comments: See additional detailed comments in individual 2001, 2002 and 2003 reports.

B.2 <u>OUTCOME GOAL for IDEAS</u>: Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society." Comments: See additional detailed comments in individual 2001, 2002 and 2003 reports.
B.3 <u>OUTCOME GOAL for TOOLS:</u> Providing "broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation." Comments: See additional detailed comments in individual 2001, 2002 and 2003 reports.
B.4 <u>OUTCOME GOAL for ORGANIZATIONAL EXCELLENCE</u>: Providing "an agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices." Comments: See additional detailed comments in individual 2001, 2002 and 2003 reports.

SPECIAL PROGRAM ASSESSMENT RATING TOOL (PART) QUESTIONS

The NSF would also like your advice about several questions related specifically to the ITR program. Please comment on both scientific and management aspects of each of the following program-specific questions:

1. *Has the ITR Program made significant research contributions to software design and quality, scalable information infrastructure, high-end computing, workforce, and socio-economic impacts of IT?*

Yes, the ITR program has made significant research contributions to software design and quality, scalable information infrastructure, high-end computing, workforce, and socio-economic impacts of IT.

It has supported innovative projects that would not otherwise be supported from the disciplinary programs. The scope of the programs was broad, and has opened up new subfields of computer science including bio-informatics, human-robot interaction and computational medicine for example.

The scale of the grants enables researchers to mine, visualize and model huge datasets, to tackle large problems ranging from global warming, to economic recession, to traffic jams and encouraged faculty and students from diverse backgrounds to cross-train for new fields and positions using IT. The program has supported many projects bringing computer science and information technology to K-12 schools and to the public both through hands-on projects and through tools to assess learning and teaching.

2. *Has the ITR program served an appropriate role in ensuring that grantees meaningfully and effectively collaborate across disciplines of science and engineering?*

Yes, NSF did serve an appropriate role in ensuring that grantees meaningfully and effectively collaborate across disciplines of science and engineering.

One of the broadest contributions that ITR has made has been to develop interdisciplinary interactions between and across disciplines. These are partnerships that would likely not have spontaneously formed without the infusion of money that ITR brought, and many of these collaborations will last far beyond the duration of the ITR program.

Medium and large ITR grants were daunting management challenges. Large proposals were always allowed extra pages for a management plan. By 2002, NSF was encouraging investigators to provide a management plan, including their plan for coordinating across sites for both medium and large proposals. Panels were asked to assess management plans as part of their overall review.

PART C. OTHER TOPICS

EXECUTIVE SUMMARY OF SECTION C:

Section C allowed the COV members to address other topics that may not have been covered in sections A and B. This executive summary addresses issues that were cross-cutting across the years or topics for which there was a divergence of opinion.

The goals and objectives of the ITR solicitation changed from year to year. As ITR was a new and broad initiative, the community response was somewhat unexpected (and very enthusiastic). NSF responded to the needs of the research community, the nation, and to the necessary restructuring of the program by refining the solicitations and guidelines for each year. This was an effective means to quickly adapt to the community's activities.

The COV was impressed by the heroic efforts of the NSF staff in all aspects of implementing this large, new, multidisciplinary Priority Area. Staffing levels were at the bare minimum, and will continue to have an effect on the overall program assessment in terms of post award tracking, evaluation of outcomes, and oversight of large-scale programs.

Through ITR, NSF is investing in frontier fields of IT that were previously unsupported. Other countries have already begun such investments, and continuing investments by NSF will be important to maintain US competitiveness. In a similar vein, continuing support after the ITR program for products, tools and infrastructure will be very important, particularly when a significant investment has been made and the project outcomes will not be available until the out years.

Of general concern in light of drastic budget cuts was the balance between maintaining a reasonable percentage of funded proposals and maintaining sufficient funds (particularly in large and medium proposals) to assure that the science and activities proposed could be adequately performed under severe funding restrictions. Although no general consensus on how to address this issue emerged from the COV, most thought that serious cuts in funds for any particular proposal needed to be very carefully addressed to assure positive results.

For many PI's in the large and medium proposals, management of diverse and multidisciplinary programs was a new endeavor. Over the years, much knowledge has been gained by the community for understanding and management of such facilities and projects. Efforts should be made to assure that these lessons learned have a mechanism of transfer to subsequent PI's who will need these skills.

For detailed responses to the questions in Part C, see the individual year reports for 2001, 2002, and 2003.

SIGNATURE BLOCK:

Dr Mary Jane Irwin

For the ITR
Mary Jane Irwin
Chair

ITR COV: FY 2001 REPORT

Date of COV: Mar 8, 9, 10, 2005
Program/Cluster: Information Technology Research Priority Area
Division:
Directorate: CISE
Number of actions reviewed by COV[1]: Awards: 71 Declinations: 59 Other:
Total number of actions within Program/Cluster/Division during period being reviewed by COV[2]: Awards: Declinations: Other:
Manner in which reviewed actions were selected: Self-selected by COV reviewers from random sample provided by NSF

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.

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]**
1. Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) Comments: The committee expressed overall satisfaction of the review mechanism and the NSF ITR managers and staff did an excellent job in administering the ITR program.	YES

[1] To be provided by NSF staff.
[2] To be provided by NSF staff.
[3] If "Not Applicable" please explain why in the "Comments" section.

2. Is the review process efficient and effective? Comments: In general the review process is efficient and satisfactory. The committee recognizes the difficulty in appointing an equal number of relevant intellectual expert reviewers for each of the submitted proposals.	YES
3. Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines? Comments: The Program Managers have done an excellent job in identifying high quality reviewers and experts to participate in the ITR review process. The NSF staff should be commended for their outstanding efforts to maintain the highest quality merit review system and to assurance that proposals do not have any potential conflicts of interest during the review process.	YES
4. 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: In general, the reviewer's comments and recommendations have provided sufficient feedback to the PIs. In a few cases, the reviews did not provide sufficient information for the PI. We strongly encourage that the NSF continue to guide reviewers with the forms provided.	YES
5. Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments: Yes, the panel summaries usually reflect the overall assessment of the panel recommendations. However, in some cases, if there is a wide dispersion in the assessment of the proposal, care should be taken to provide some additional information to clarify the decision.	YES

6. Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: In most cases, the documentation for recommendations is complete and the decision is consistent with the panel and the reviewer comments. However, in a few cases, we observed a unexplained divergence between the panel recommendations and that final funding decision. We recognize that the Program Officers need to have the flexibility in the final decision process. However, in such cases, we recommend that the Program Officer provide an additional explanation paragraph to the jacket.	YES
7. Is the time to decision appropriate? Comments: The NSF should be commended for the rapid turn-around time of approximately 4 to 6 months for the review process.	YES
8. Discuss any issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures: The Committee feels that the NSF has done an excellent job in effectively managing the merit review process.	

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[4]**
1. Have the individual reviews (either mail or panel) addressed both merit review criteria? Comments: Intellectual merit is uniformly very well evaluated. The reviews are somewhat variable in their depth and detail, but most also provide good feedback to the PIs. However the "broader impacts" and relation to the ITR mission are at times omitted from review, and other times it was rather superficial. Some COV members noticed that at times small ITR proposals were reviewed within a review panel that was not exclusively reviewing ITR proposals. In these cases it seemed that little attention was sometimes paid to the relevance of the proposed research to the ITR mission.	NO
2. Have the panel summaries addressed both merit review criteria? Comments: As shown by table A.2.2 only about half of 2001 panel summaries cover both merit criteria. The more frequent omission is "broader impact", and relevance to the ITR mission.	NO
3. Have the *review analyses* (Form 7s) addressed both merit review criteria? Comments: In 2001 there is variation across large, medium, and small proposal review analyses. As shown by table A.2.3. about 70% of the large proposals review analyses include both criteria, but less than 20% of the medium and small proposal analyses include both. The more frequently omitted category is "broader impacts."	NO

[4] In "Not Applicable" please explain why in the "Comments" section.

4. Discuss any issues the COV has identified with respect to implementation of NSF's merit review criteria.

There was variation in the depth and breadth of individual reviews. With regard to the quality of Intellectual Merit evaluations, the individual reviews were generally excellent.

There was also some variability in panel summary reviews. Especially for the large proposals, the cursory reviews present problems when there is diversity of merit evaluation across the reviewers. Some panel summaries were good and insightful, but others could have been more explicit when such diversity exists, in order to record the logic of the deliberations.

As to be expected in a review of interdisciplinary research, some reviewers noted that their expertise was limited and that their evaluative comments were directed at a subset of the proposed research activities. This appears to be a valuable message to the review panels. When such comments are omitted, it is difficult to make judgments about the meaning of a lack of commentary on certain features of the research.

In an interdisciplinary review the Foundation might consider offering to reviewers a model structure of reviews in order to encourage deeper reviews *and* ask the reviewer to comment on specific areas that they have no competence to review. They should also encourage the panel summaries to offer more details on the logic of the deliberations. It may also be useful to use mail review (in addition to panels) to help provide the panels with more technical expertise.

Some reviews omitted the broader impact and relevance to ITR mission. Reviewers should be encouraged to explicitly comment on this aspect.

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**[5]
1. Did the program make use of an adequate number of reviewers? Comments: There were 1990 reviewers for 1642 proposals in 2001. Nearly all proposals underwent panel review, and similar processes, with limited use of ad hoc or mail review.	YES
2. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: Dividing the proposals into so many subareas provided the basis for ensuring appropriate expertise and qualifications. In some cases, it was noted that the diversity of expertise among the reviewers tracked the disciplinary diversity of the proposal. This means that proposals that were deliberately targeting true boundary areas of collaboration may have received a wider range of ranks than a proposal with a very narrow focus. The panel discussion process seems essential to handling these situations. Mail reviews provide fewer means for either resolving disparate scores or providing an assessment of broader impacts for very convergent scores.	YES

[5] If "Not Applicable" please explain why in the "Comments" section.

3. Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: Representation for the research and education domains was established for those areas taking into account the need for geographic and institutional distribution as well as diversity. In some cases, institutional diversity among panel reviewers notably included NGO, national labs, formal and informal K-12 educational programs which led to a much more robust evaluation of the broader impacts of a project. In other cases, especially in the rare mail reviewed proposal, expertise was concentrated within the proposals core research area resulting in reviews that were much more strongly driven by the intellectual merit and its impacts within the more narrow community. The COV did not find sufficient information to judge whether underrepresented groups and minority-serving institutions were well-represented among reviewers. However, the COV found that NSF staff is very sensitive to this issue.	INSUFFICIENT DATA
4. Did the program recognize and resolve conflicts of interest when appropriate? Comments: The documentation provided is quite clear concerning the recognition and resolution of apparent conflicts of interest when a reviewer recognized the potential for a less obvious aspect and the program had to respond. However, this is a difficult question to evaluate as there is little information on the panel selection process that went on prior to the formation of the panels that appear in the jacket. Most of the actual determination of potential conflict is handled by program officers in advance of panel meetings, and so major concerns are pre-addressed, in effect.	YES

5. Discuss any issues the COV has identified relevant to selection of reviewers.

By focusing on one cohort in the COV, it is difficult to detect change through time in the number of conflicted potential reviewers. It seems reasonable to assume that COI was less of a problem for forming panels at the beginning of the program, and specifically for our analysis of FY 2001, when a smaller number of potential reviewers were engaged in collaborations from prior-awarded Large ITRs. By 2004 it was widely recognized within most communities that large collaborative proposals were having a damaging effect on the pool of potential reviewers. Correspondingly, the COV subgroup concerned with the most recent actions will have the best perspective.

More than a dozen panels were constituted to cover the subject matter along with the division into the three size classes, small, medium and large activities as specified in Program. Specifically, small proposals went to Directorate panels for the specific areas, for which there were a total of 34 panels. Preproposals were appropriately used to help the community evaluate what efforts would be worth pursuing in terms of funding opportunities. Medium preproposals were evaluated with 27 panels and the full proposals were evaluated through 15 panels. Specific research domains, jointly considered by CISE but led by the Directorate of Officer responsible for the domain, used ad hoc review to an extent that reflects the peer review practices expected in their respective community. Ad hoc reviewers are more likely to reflect more narrow technical aspects but ensure that key features of a proposal are adequately considered. The use of the input from ad hoc reviewers is quite clearly described.

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[6], OR DATA NOT AVAILABLE

[6] If “Not Appropriate” please explain why in the “Comments” section.

1. Overall quality of the research and/or education projects supported by the program. Comments: The quality of the supported work appears to be high based on the projects reviewed by the CoV and the information provided. For example, the Bits and Atoms award enabled the design and construction of a toddling robot that combines physical and computer-based control systems to allow for low power locomotion over variable terrains that are key for many robotic application environments. The Mobile Sensor Web for Polar Ice Sheets award enabled the creation of a web site that was chosen as exemplary for math and science K-12 education. It would have been helpful if more of the annual reports were available in the jackets. In the large category, many of the awards significantly supported extensions of IT infrastructure to underrepresented communities, regions and social groups, in addition to supporting research. These extensions often appropriately involved engineering of off-the-shelf technology, rather than novel IT research. We would hope and expect to see research outcomes made possible by this infrastructure in the upcoming years. Many of the rejected proposals also appear to be of high quality.	APPROPRIATE
2. Are awards appropriate in size and duration for the scope of the projects? Comments: In 2001, the size and duration of awards was reasonably well correlated with the scope of the projects. Average award sizes were $338Ks for small, $1.4M for medium, and $11.2M for large. Average award durations were 3.0 years for small, 4.25 years for medium, and 5 years for large. It is encouraging to see support for 5 year projects at this level of funding. These proposals are ambitious and multidisciplinary, and require long term funding to succeed. The CoV notes, however, that many of the large projects have scopes that require larger levels of funding and longer duration to fully realize the goals and objectives of the projects. We recommend that NSF consider ways to continue to fund some set of the large projects initiated under ITR.	APPROPRIATE

3. Does the program portfolio have an appropriate balance of: • High risk projects? Comments: The portfolio contains both large and multidisciplinary projects. Each of these project characteristics carry risk. Large projects are inherently risky because of the management challenges. Multidisciplinary projects are inherently risky because of the challenges in communicating across disciplines. The review process appears to make effort to identify and reward high risk proposals, though not all reviewers are attuned to this and the panels sometimes reflect a common conservatism. Based on our data, it appears that ITR funded a considerable number of high risk projects (both technically and managerially), and we find this appropriate.	APPROPRIATE
4. Does the program portfolio have an appropriate balance of: • Multidisciplinary projects? Comments: Based on the available data, in 2001, approximately 40% of small awards were multidisciplinary, 55% of medium awards were multidisciplinary, and 100% of large awards were multidisciplinary. This mix reflects well the overall ITR emphasis on multidisciplinary work, as well as the 2001 emphasis on (1) applications of IT across the sciences and engineering and (2) extensions of IT education and infrastructure. It is also appropriate that larger awards were more predominantly multidisciplinary. We find this high level of multidisciplinary projects to be highly appropriate and one of the greatest strengths of ITR. It would be useful for NSF to collect and provide data on the disciplines of the project participants so the CoV can better assess multidisciplinarity.	APPROPRIATE
5. Does the program portfolio have an appropriate balance of: • Innovative projects? Comments: The projects in the portfolio contain significant innovation. We see disciplinary innovation in many small and medium projects; we see innovation in the scope and type of problems tackled by large projects.	APPROPRIATE

6. Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals? Comments: The program contains a mix of individual awards (in the small category), group awards (in the small and medium category), and center-scale awards (in the large category). Large and medium awards were targeted at 70% of each Directorate's ITR funds, and small awards targeted at 30% of each Directorate's ITR funds. This balance seems appropriate for the ITR program.	APPROPRIATE
7. Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments: In 2001, new investigators had success rates of 11% for small awards, 31% for medium awards, and 22% for large awards. This compares to success rates in the total population of investigators of 16% for small awards, 32% for medium awards, and 34% for large awards. New investigator success rates track reasonably well with overall success rates.	APPROPRIATE
8. Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments: The geographical distribution of investigators follows the population distribution of the states strongly. There is a bias toward the older Eastern seaboard and Midwest states, likely based on distribution of universities. The small proposal submissions followed this pattern substantially, while among the medium submissions, there were some slight adjustments in the rank order by dollar amount. The large submissions did not show substantial geographic distribution in the data, however, there could have been more distribution in the form of collaborative and joint projects that are hidden in the data.	APPROPRIATE

9. Does the program portfolio have an appropriate balance of: • Institutional types? Comments: The distribution of projects in the portfolio reflects a high number of projects at research-intensive institutions, a modest number of projects at non-research-intensive institutions, and very little representation at other institution types. This seems appropriate for a research-intensive program. With respect to the representation of minority-serving institutions, the data show that the success rate in 2001 for minority-serving institutions is highly variable by project size. There were no successful large awards from minority-serving institutions; there was a 100% success rate for medium awards (but very few awards); and an 11% success rate for small awards, compared to 16% for non-minority-serving institutions. We have a difficult time determining if this is appropriate, in part because minority-institution participation is masked by the use of subcontracts in 2001, as well as the small number of proposals.	APPROPRIATE
10. Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments: All projects have a component of education that typically includes students (graduate and undergraduate) and sometimes reaches out to the K-12 or general public communities. Some projects have notably extensive educational activities and products. For example, the Bits and Atoms project produced low cost fabrication kits that are being used to provide underrepresented students with hands-on laboratory experiences. However, in many cases, the education components need to be more closely integrated with the research activity, particularly in the proposal description of the project.	APPROPRIATE
11. Does the program portfolio have an appropriate balance: • Across disciplines and sub-disciplines of the activity and of emerging opportunities? Comments: The ITR emphasis is on multidisciplinary work, and the 2001 portfolio reflects this. The projects are appropriately broad and impressive in their coverage of disciplines. The ITR program received an extremely large number of diverse proposals, and many good proposals that provide intellectual diversity could not be funded due to budget constraints. The COV observes that ITR has transformed the approach to problem solving to include people working across disciplines, and therefore future funding needs to recognize and support this way of conducting research and education.	Appropriate

12. Does the program portfolio have appropriate participation of underrepresented groups? Comments: This is an area of national need. The number of underrepresented ethnic minority persons engaged in the research as PI or Co-PIs is extremely small. This reflects the small number of such persons in science, generally, and the resulting extremely small number engaged in advanced research. See No. 14. Regarding gender, the proposal success rates for women are similar to the proposal success rates for men, except in the large category. In 2001 there were no large awards with a female PI, though there were also very few submissions with female PIs.	APPROPRIATE
13. Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. Comments: The program is highly relevant to agency mission. In 2001, one area of emphasis was applications of IT to science, directly supporting NSF's mission in advancing the sciences. The program is also relevant to national and international priorities. For example, in 2001 the Mobile Sensor Network for Polar Ice Sheet Measurements aims to understand the contribution of polar ice to increases in sea level -- an area of broad environmental concern.	APPROPRIATE
14. Discuss any concerns relevant to the quality of the projects or the balance of the portfolio. There should be a continuing concerted effort to increase the number of minority doctorates in the sciences, engineering, and mathematics. The composition of the workforce is changing and the scientific research enterprise is a long-term venture. Research into the changes of the educational system that will foster the entry of persons into the science and engineering workforce is critical.	

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

1. Management of the program.
Comments:
ITR program was the first such program that focused primarily on significant interdisciplinary, inter-institutional and international collaborations on research and applications of IT. NSF should be commended for having such a program that significantly impacted many research communities. The ITR FY2001 was the second year of the ITR Program. The program was considerably broadened to include not only fundamental research in IT, but also new applications of IT in all scientific, engineering, and educational areas, as well as innovative infrastructure to support IT research and education. The comments on the management are given in terms of three processes (1) management of the overall program, (2) management of the proposal review process, and (3) management of the oversight on large-scale grants.

ITR FY2001 included all directorates of NSF, with CISE taking the lead on the management of the program. The program was managed by a committee consisting of volunteers from each of the different directorates. ITR FY2001, only two people had ITR as their major responsibility --- the Program Director and an Associate Program Director. In FY2001, there were approximately 40 staff members, who volunteered time beyond their regular program commitments to help with the ITR program. The directorates should be commended for their efforts. It is, however, very alarming that a program of this magnitude, $191M for FY2001, did not have dedicated staff from all directorates to oversee the program.

While representatives from all directorates were involved with the proposal review process, CISE was responsible for the initial processing of proposals and organizing the review panels. CISE should be praised for its significant (more like miraculous) efforts as CISE received 1642 proposals and organized 78 panels for ITR 2001. The ITR FY2001 committee of volunteers did excellent jobs managing the review process and providing feedback to the PIs in a timely manner. In reviewing the jackets, however, it is obvious from the time stamps on emails that program directors were working very long hours seven days a week. While the response was timely, this should not require overworking existing staff. It is noted again that dedicated staff from all directorates is very much needed to handle the review process.

The management of large-scale grants is deserving of attention. Based upon the review of proposal jackets, it became obvious that many large-scale awards, while having significant research, often suffered from lack of sufficient management as noted in the comments from the visits. The ITR FY2001 solicitation noted that large projects are similar to ERCs and STCs. It is noted that ERCs and STCs are generally for a time period of 10 years, for which it is advantageous to put into place the infrastructure needed for insuring that all participates have a common vision and focus. In terms of the ITR program, however, support for only 5 years is provided which makes the effective management of these project difficult.

The points raise two issues. First, it is important that large-scale grants be required to have an effective management plan, similar to an STC or ERC, with guidance on options beyond the end of the program. Further, again, dedicated staff is needed to manage the frequency of site visits.

2. Responsiveness of the program to emerging research and education opportunities. Comments: In general, the ITR was very responsive to emerging research and educational opportunities, for which CISE and the other directorates should be commended. In FY2001, the ITR solicitation was considerably broadened to include not only fundamental research in IT, but also new applications of IT in all scientific, engineering, and educational areas, as well as innovative infrastructure to support IT research and education.
3. Program planning and prioritization process (internal and external) that guided the development of the portfolio. Comments: Overall, the management utilized the results from FY2000 to plan and prioritize for FY2001.
4. Additional concerns relevant to the management of the program. See section C.1.

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

Comments:
ITR established a new environment for interdisciplinary and multi-institutional research. ITR awards covered a wide spectrum of new applications and involved diverse technologies and human resources. The infrastructure was developed to create scientific opportunities for a broad community of people. Some examples of awards include:

- ACI 0113051 Ferris Cancer treatment using optimization
- IVDGL 0086044 Avery, (GriPhyN – Towards Petascale Virtual Data Grids)

The ITR program created opportunities for increased collaboration and awareness of interdisciplinary research activities.

It is not evident that the ITR program helped to engage and significantly broaden the participation of females and underrepresented minorities in its research, education, or outreach activities. The ITR program would have benefited from more engagement with the scientific community within high-tech industries and laboratories.

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

Comments:
The ITR program has been extremely successful in developing science spanning multiple disciplines. It made a very important step in funding of large projects that allows for larger scale planning for the scientific community.

The program established a new environment for discovery across the frontier of science and engineering by recognizing the interdisciplinary nature of scientific research and the pervasive ubiquity of computing. Few problems in which the larger society is concerned are strictly within any one of the specialties into which science has become partitioned. The ITR program has fostered innovation into areas that would have been very hard to address and fund in other existing programs.

One example is James Demmel's ITR (0122599) CITRIS project, that focuses on understanding how to build societal scale information systems. The project developed operating systems for tiny ubiquitous devices like sensors (tiny OS), developed a programming language to program such devices remotely (tiny BD), and developed the Picardo system to deal with low-power use requirements of such radio devices.

Gogineni 0122520 A Mobile Sensor Web for Polar Ice Sheet Measurements that developed innovative sensors— imaging and sounding radars— to measure key glaciological parameters for studying the contribution of polar ice sheets to sea level rise, and demonstrated their effectiveness.

Szalay's ITR grant 0122449 Building the Framework of the US Virtual Observatory. They developed a scheme to record and search data observed, and succeeded in getting the international scientific community to adopt the scheme. The system developed has incorporated a number of existing catalogs.

Jordan's SCEC ITR project on 0122464 An Information Infrastructure for System-Level Earthquake Research that facilitated the investigation, modification, and adoption of these physics-based models, which improved the system-level understanding of earthquake phenomena and can substantially improve the utilization of seismic hazard analysis.

A different example is Blelloch's ITR (0122581) ALADDIN project, a center for Applied Algorithms, that developed algorithmic tools for dealing with a wide variety of issues ranging from Computer-Human Authentication to Scheduling network connections.

But beyond these projects an additional important outcome is the increased awareness of the importance of such collaborative, interdisciplinary projects. We expect that there will be many continued rewards assuming there is continued findings and focus on such research. In some cases, the ITR funding provided lots of infrastructure and basis for ideas. With continued investment we will be able to reap many more benefits from the developed infrastructure and the changed scientific focus.

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

Comments:
The ITR program was extremely successful in making available state-of-the-art facilities and tools that are beginning to transform diverse fields of inquiry. For example, in 2001 there were significant investments in grid computing facilities that are enabling scientists located around the world to conduct their research in new ways. As another example, in 2001 there was investment in the National Virtual Observatory, which is making astronomy data broadly available to scientists.

The CoV notes that most of the developed tools and infrastructure will require maintenance and updates in the future to remain useful and reap the full benefits in discovery, learning and innovation.

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

Comments:
The advent of the medium and large size ITR awards challenged the academic community to raise the standards and mechanisms for collaboration in large groups. The lessons learned from the ITR process of managing interdisciplinary projects should help NSF in future programs involving these projects. The ITR program led to the identification of new collaborative activities within NSF staff to create new funding management partnerships among the directorates.

The overall success of fulfilling the mission of any organization hinges both on the loftiness of its ideas and purpose, and on the effectivness and efficiency of its business practices. Thus, it is absolutely critical that every organization institute a standardized business and management process for ensuring that it is using current and relevant business practices to accomplish its goals, objectives and ultimately its mission. This standardized business and management process should employ research findings from the business community and quality engineering community that address the development of practices, implementation of practices, assessment of practices and continuous process improvement of current practices for ITR programs and future programs of NSF.

It is gleaned from information in the ITR highlights section of the COV website, discussions with NSF staffers, and ADs that the business practices used for ITR 2001 would have benefitted from state-of-the-art business practices, such as strategic alignment, stakeholder analysis, six sigma, etc..

PART Questions of Team 2001

1. Has the ITR program made significant research contributions to software design and quality, scalable information infrastructure high-end computing, IT workforce and socio-economic impacts of IT?

The ITR program has greatly contributed to the formation of IT workforce through the funding of graduate students and postdocs. What is particularly significant is that since the projects are large and multidisciplinary in nature, the program has provided a broader formation of this workforce. The program has also had an impact at the undergraduate level by the fact that many projects involve research with undergraduates.

The ITR program has also contributed to the development of new and unique software, some of which has only been possible by the large team efforts involved in some of the projects. A concern, however, is the maintenance and further development of this software beyond the expiration date of the awards. It is not clear that universities or industry will be providing some of these funds.

Given the large scope of many projects, the ITR program has promoted scalable information infrastructure.

2. Has the ITR program served an appropriate role in ensuring that grantees meaningfully and effectively collaborate across disciplines of science and engineering?

In our view this has been the major strength of the ITR program. Virtually all the projects we reviewed involve researchers from multiple disciplines. Most of these collaborations have been meaningful since teams are usually composed of domain experts (e.g. civil, chemical, electrical, and mechanical engineers, physicists, biologists, chemists) and computational experts (e.g. computer scientists, operations researchers, applied mathematicians). The major outcomes of the projects have been clearly a powerful synergy of members of these teams.

If one were to measure the impact of the ITR program by the way it has enabled collaborations across disciplines, it would be an unqualified success.

PART C. OTHER TOPICS

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

The NSF should work to incorporate the research advances of the management community into the work practices of the agency. The management community has developed and validated many business practices that could help to ensure the overall success of program planning and administration within the agency. For example, research efforts of the business schools and corporate management entities that have shown "best practices" for planning efforts, prioritization rubrics, and process improvement analysis that can be modified appropriately to fit the specific business environment of NSF thus helping to ensure the success of managing programs, projects, and initiatives.

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.

In FY2001, ITR had clearly stated goals and objectives, which were given in the solicitation as the following:

> *The purpose of this program is to augment the knowledge base and increase the workforce needed to enhance the value of Information Technology (IT) for everyone. IT will be essential for solving critical national problems in areas such as fundamental science and engineering, education, the environment, health care, and government operations. But new fundamental understandings are required to make optimal progress. To meet these needs, this solicitation requests proposal in the following three categories:*
>
> - *Fundamental research in IT*
> - *Applications of IT across the sciences and engineering*
> - *Extensions of IT education and infrastructure*

Based upon the jacket review, the program met the goals and objectives as given above.

Although we were charged with reviewing FY2001 only, if we consider the solicitations for FY2001, FY2002, FY2003, we find that the goals and objectives change each year. This high frequency of change raises concern about having clearly defined goals and objectives for the ITR program, as generally clearly defined goals and objectives remain fixed for longer than one year.

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

NSF Staffing and Program Management
NSF interdisciplinary initiatives need a staffing model that recognizes that the initiative can add significantly to existing staff workload. Resource staffing and allocation models and practices should be used to determine staffing needs for new program efforts. NSF should support professional dedicated managers for large multidisciplinary projects.

Now that the formal ITR initiative has ended, NSF should create organizational devices to sustain the cross-directorate collaboration introduced by ITR. For example, NSF should sustain the directorate sequestering of ITR monies; NSF should consider maintaining the ITR inter-directorate teams.

Panels
The committee realizes that the recruitment of reviewers is difficult in large interdisciplinary initiatives. Nonetheless, it believes that some evaluations of proposals suffered from the lack of input from reviewers with expertise in the area being reviewed. In selecting reviewers, both those able to evaluate the intellectual merit and the broader impacts of the research are needed

Panel review and mail reviews both are valuable. Especially in interdisciplinary programs, discussion among panel members is an important method of reconciling the inevitable diversity of views.

Funding Decisions
On some funded projects, budgets were drastically cut without explicit documentation on why the cut decision was made or what effects the cut might have on the project's success. While the COV acknowledges the needs for program director flexibility, drastic cuts of funded projects demand justification as they can lead to wasted resources.

Interdisciplinary research often takes more time to produce payoffs that single discipline research. Many excellent projects funded by ITR are just now producing exciting results. NSF should attend to which of these deserve extensions of funding for real payoffs and which do not.

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

High Risk
In competitions where goals include a certain proportion of “high risk” projects, reviewers should be instructed to indicate in their review if they consider the proposal to be high risk and how this affected their ranking of the proposal. This would provide greater accountability for NSF's methods and performance in achieving their target for high risk research.

Diversity
NSF needs to continue its efforts to ensure that its reviewer pool is diverse in terms of discipline, gender, age, and ethnicity. More information regarding the available pool of reviewers might help the COV better assess NSF's efforts to attain this goal.

Interdisciplinary proposals may be very time consuming to coordinate and prepare. We suggest first asking a small subset of reviewers to handle the many preproposals. The preproposals making the cut to full proposals would then be handed off to a larger team of reviewers for the evaluation of the full proposals.

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

The COV is essentially asked to be the audit process for this ITR program. For the COV to be more effective, the group would recommend that more time be allotted to consider the integration issues including interaction with a random set of the PIs, more time for discussion with program directors, and more time for COV interaction. Further, more focused effort is needed with the jacket review process.

By stratifying the COV by year of the ITR program, it created inherent difficulty to measure change over time in the program.

Given that COV's are conducted routinely, the process would be enhanced by NSF developing a set of process steps and proven procedures that have led to successful COV activities in the past.

ITR COV: FY 2002 REPORT

Date of COV: Mar 8, 9, 10, 2005			
Program/Cluster: Information Technology Research Priority Area			
Division:			
Directorate: CISE			
Number of actions reviewed by COV[1]:	**Awards: 56**	**Declinations: 45**	**Other:**
Total number of actions within Program/Cluster/Division during period being reviewed by COV[2]:	**Awards:**	**Declinations:**	**Other:**
Manner in which reviewed actions were selected: Self-selected by COV reviewers from random sample provided by NSF			

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.

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]
1. Is the review mechanism appropriate? (panels, ad hoc reviews, site visits)	YES
2. Is the review process efficient and effective?	YES

[1] To be provided by NSF staff.
[2] To be provided by NSF staff.
[3] If "Not Applicable" please explain why in the "Comments" section.

3. Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines?	YES
4. 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: Many proposals had insufficient numbers of informative reviews, with many reviews and/or summaries lacking depth /substance or context. It is often unclear from the information provided in the jacket why a proposal was declined or awarded.	NO
5. Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments: Many proposals had insufficient numbers of informative reviews, with many reviews and/or summaries lacking depth /substance or context. It is often unclear from the information provided in the jacket why a proposal was declined or awarded.	NO
6. Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: The Review Analysis in Form 7 is highly variable across jackets; many use "boiler plate" language and contain no real substance.	NO
7. Is the time to decision appropriate?	YES
8. Discuss any issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures: The size and interdisciplinary nature of the ITR program proposals challenge NSF's traditional review and oversight procedures. The panels were required to be broader than usual, the proposals incorporated components (research, infrastructure, education, dissemination) which require radically different evaluation models, and the medium and large-scale projects require a greater degree of management and accountabililty than previously.	

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (<u>intellectual merit</u> and <u>broader impacts</u>) 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[4]
1. Have the individual reviews (either mail or panel) addressed both merit review criteria? Comments: COV2002 was equally split in opinion on this question. In addition, reviewers did not comment on the integration of Diversity / Outreach / Education efforts (it is noted that this was not a requirement of 2002).	NO
2. Have the panel summaries addressed both merit review criteria? Comments: Panel reviews often failed to discuss the broader impacts of the proposed work. In addition, panels did not comment on the integration of Diversity / Outreach / Education efforts (it is noted that this was not a requirement of 2002).	NO
3. Have the *review analyses* (Form 7s) addressed both merit review criteria? Comments: The Review Analysis in Form 7 is highly variable across jackets; many use "boiler plate" language and contain no real substance.	NO
4. Discuss any issues the COV has identified with respect to implementation of NSF's merit review criteria.	

[4] In "Not Applicable" please explain why in the "Comments" section.

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[5]
1. Did the program make use of an adequate number of reviewers? Comments: COV2002 is defining "reviewers" as individuals who read the proposal and provided a written review. There was significant disagreement among the team as to what is the right number of reviews. Some members considered three reasonable reviews as sufficient and all but one jacket met this lower bound. A number of members did not consider three reviews as sufficient.	YES
2. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: Some panels reviewed a broad range of interdisciplinary proposals and did not use any reviewers outside the panel. This resulted in some of those proposals not receiving reviews from any people with the appropriate level of expertise. In some cases, the panel had members who were appropriate reviewers who were not assigned to the proper proposal(s).	YES
3. Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: Some panels had very poor gender balance. Some panels had poor balance between industry, academia and government laboratories. There is no data available to the COV on underrepresented minorities participation in the review process, making an assessment of this issue impossible.	NO
4. Did the program recognize and resolve conflicts of interest when appropriate?	YES
5. Discuss any issues the COV has identified relevant to selection of reviewers.	

[5] If "Not Applicable" please explain why in the "Comments" section.

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[6], OR DATA NOT AVAILABLE
1. Overall quality of the research and/or education projects supported by the program. Comments: Many of the funded projects were considered exciting and innovative by the reviewers	APPROPRIATE
2. Are awards appropriate in size and duration for the scope of the projects? Comments: Duration or planning of projects should allow for archival and sustainability of persistent resources (including data) and infrastructure; some projects receive lesser funding than initially proposed – the reduced budgets for some projects may limit their potential for success	INSUFFICIENT DATA
3. Does the program portfolio have an appropriate balance of: • High risk projects? Comments: COV2002 saw <25% projects that were identified by reviewers as "high risk"	NOT APPROPRIATE
4. Does the program portfolio have an appropriate balance of: • Multidisciplinary projects?	APPROPRIATE
5. Does the program portfolio have an appropriate balance of: • Innovative projects? Comments: The combination of approaches and problems and disciplines were innovative, even though the components were not	APPROPRIATE
6. Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals?	APPROPRIATE

[6] If "Not Appropriate" please explain why in the "Comments" section.

7. Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments: COV2002 is concerned with the low number of new investigators on ITR proposals; however, the low numbers may be due to the existence of the CAREER and other NSF programs for young investigators	APPROPRIATE
8. Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators?	APPROPRIATE
9. Does the program portfolio have an appropriate balance of: • Institutional types? Comments: Could be better; would like to see more collaborations between large institutions and smaller and / or minority-serving institutions	APPROPRIATE
10. Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments: There should be a larger emphasis on interdisciplinary education, particularly given the stated multidisciplinary goals of the ITR program; interdisciplinary education is harder to do well than domain-based education.	NOT APPROPRIATE
11. Does the program portfolio have an appropriate balance: • Across disciplines and subdisciplines of the activity and of emerging opportunities?	APPROPRIATE
12. Does the program portfolio have appropriate participation of underrepresented groups? Comments: Not appropriate for gender distribution; insufficient data for underrepresented minorities	NOT APPROPRIATE; INSUFFICIENT DATA
13. Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports.	APPROPRIATE
14. Discuss any concerns relevant to the quality of the projects or the balance of the portfolio.	

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

1. Management of the program. Comments: Many projects lack detailed and informative annual project reports.
2. Responsiveness of the program to emerging research and education opportunities.
3. Program planning and prioritization process (internal and external) that guided the development of the portfolio. Comments: There is no model for infrastructure evaluation and impact.
4. Additional concerns relevant to the management of the program. There is no formal tracking of the impact(s) on IT and other domain disciplines from the ITR projects. There is insufficient structure in place for appropriate evaluation and continuing oversight of large and medium 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."

Comments: The ITR program continues the exemplary NSF approach to emphasizing the development of human resources.

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

Comments: COV02 believes that the program achieved the goal as stated above.

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

Comments: Program provided state-of-the-art tools however data is lacking to quantify or assess future success.

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

Comments: Needs work ; however, management of the program is a continous learning process and improvement from year to year can already be observed.

1. Has the ITR Program made significant research contributions to software design and quality, scalable information infrastructure, high-end computing, workforce, and socio-economic impacts of IT?

From the sampling of projects, most software and information infrastructure contributions were targeted to benefit the project and/or were developed to demonstrate innovative computer science ideas. This is an important pre-requisite to the development of scalable and well-designed information infrastructure but it is not the same. ITR focused on research rather than development so there was insufficient data or demonstration to evaluate the impact of software design and quality, scalability, usability, or usefulness.

From the proposals I evaluated in the 2002 group, it was hard to assess the socio-economic and workforce impacts of the ITR program.

2. Has the ITR program served an appropriate role in ensuring that grantees meaningfully and effectively collaborate across disciplines of science and engineering?

Yes. The ITR program appears to have been very successful in fostering collaborations across disciplines. In many cases, teams of researchers from disciplines who were in the ITR program are still collaborating. It is also the case that teams of researchers whose proposals were not funded but got together to submit to the RFP have also kept collaborating.

PART C. OTHER TOPICS

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

Large and medium projects need: (1) management plans, (2) clear timelines and metrics of success linked to management plans determined after award of grant in collaboration with program manager, (3) a larger number of reviews and from experts in the field, (4) more oversight during the lifetime of the project.

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.

Broadly increased the awareness of the importance of interdisciplinary and computational research at all levels of university community independent of whether projects were awarded or not.

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

Need to capture the realities of contemporary science with appropriate models and metrics for infrastructure and education as well as traditional forms of research.

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

Major funding should not be committed without substantive expert advice from all areas involved.

There is too much variance in the criteria used in the reviewers' evaluations, so that the use of vague terms like "intellectual merit" or "broad impacts" can lead to unwanted variance in evaluations. That leads to non-responses or superficial responses to these questions on criteria. The problem is compounded when these are criteria that PIs are supposed to address in their proposals, so that reviewer comments are constrained to respond to these arguments.
Even if comments move beyond PIs' frameworks, it is not clear how this listing enters into evaluation of the proposal. Better to know how important the intellectual merit is in its contributions to science; how original or pathbreaking are the hypotheses (rarely noted in the comments); how innovative and high risk is the proposed activity; how valuable the likely rewards from the project; how well-articulated, specified and feasible is the research plan; how (and in what way) is the project multidisciplinary. These may not be the only or best criteria, but having some standardized ratings would provide a clearer framework for reviewers (who might give more reasoned overall evaluations if these criteria were rated first), as well as clearer feedback to PIs.
In the same way, "broader impacts" might specify for whom: scientists in the same fields, in different fields, for students (both graduate and undergraduate), for business/government or for the public more generally. Possibly, there may be other criteria to be evaluated.

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

The usefulness of nuggets would have been significantly improved by the inclusion of data on metrics of usefulness and usage. Formal presentations of the nuggets were not necessary. Web access to them would have been sufficient.

ITR COV: FY 2003 REPORT

Date of COV: Mar 8, 9, 10, 2005
Program/Cluster: Information Technology Research Priority Area
Division:
Directorate: CISE
Number of actions reviewed by COV[1]: Awards: 54 Declinations: 6 Other:
Total number of actions within Program/Cluster/Division during period being reviewed by COV[2]: Awards: Declinations: Other:
Manner in which reviewed actions were selected: Self-selected by COV reviewers from random sample provided by NSF

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.

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

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. Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) Comments: Overall, the review process was appropriate, though some improvements can be made. It is appropriate that all large awards were reviewed by panels where the largest spend was made, and that about 50% were reviewed via both mail and panel discussion. Panels provide a good filter for anonymous reviews, which are of variable quality. There is a concern that the panelists, particularly in a multidisciplinary programs, had to rely on a sole expert in a particular field so appropriate assessment from different reviewers/panelists could not be accomplished or may be overly influenced by one experts opinion. It is recommended that more high quality mail reviews be required.	YES
2. Is the review process efficient and effective? Comments: Effective: Yes; Efficient: No. We heard many comments from NSF staff that the interdisciplinary aspects of ITR required coordination across directorates. However, this coordination was not staffed or directly supported in any way except through "volunteerism" and the one full time program manager. This must have resulted in a far less efficient evaluation process than would otherwise be possible with more dedicated personnel and a systematic management approach. Also, because of the multidisciplinary nature of the proposals, finding reviewers without a conflict of interest was time-inefficient and difficult, particularly for Large awards. It is recommended that NSF develop tools and information systems that can aid this process. From a panelist's perspective, panels involve a lot of costly and time-consuming travel. Perhaps new conferencing technologies will help some day as Fastlane has helped proposal submission and review.	YES

3. Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines? Comments: Generally, the reviews are consistent with the stated program goals, criteria and priorities, but the reviews tend to elaborate mostly on the intellectual merit aspects of the proposal. The broader impact criteria appear to be interpreted, assessed and applied inconsistently and in different ways. Some reviewers believe that the education of a research assistant funded by the project can be counted toward satisfying that criteria, but that is not the real intent. It is recommended that NSF develop and disseminate training material, including guidelines and model broader impact concepts, to educate NSF personnel and the extended R&D community on how to meet the broader impact criteria.	YES
4. 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: We did not have sufficient data to decide this question with any degree of certainty. On the whole, the reviews provided sufficient information to understand the recommendation across the reviews sampled. In our sample a few reviews were poor. As in any scientific writing, mail reviewers should support their opinions with details and/or references. The PI should be able to tell what (s)he would have had to do to satisfy the reviewer. Better quality mail reviews are crucial! Perhaps offer a reviewing prize, like some journals do. No money, just something to go on the c.v.	YES
5. Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments: Generally, the panel summaries of the sampled proposals were a good reflection of the written reviews and sometimes reflected additional feedback that was likely developed during the panel discussion. This feedback was consistent with the panel recommendation. Panels generally summarize and interpret mail reviews rather than providing independent information, hence less need for documentation.	YES

6. Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: In some cases, the program officer provided a very detailed and thorough review analysis using the ITR program criteria. However, in other cases, the program officer relied solely on proposal reviews and panel summary statements to convey the justification for the final recommendation. More than one program officer provided a "boiler-plate" feedback review analysis letter without any reference to specific recommendations associated with the decision. It is assumed that the program officers are supposed to consistently provide meaningful feedback. As an example, one proposal got only very good - excellent reviews and was rated highly competitive by the panel. The program officer gave a two-sentence rationale for declining the proposal. The PIs received nothing but boilerplate explanation. It may be that program officers resorted to this approach given the high volume of proposals and lack of staff support. The root cause needs to be identified and remedied.	NO
7. Is the time to decision appropriate? Comments: It is understood that NSF has a stated goal to provide a proposal decision within a six month timeframe from submission. Chart A.1.7 in the appendix shows the results. Approximately 80% of the medium and large awards were completed on time, with no review being done later than nine months from submission. The small awards had a slightly slower response rate with nearly 40% not being complete within six months. We believe delays were a result of the fact that small awards were processed by the home directorates (rather than the ITR program office directly) and these proposals may have had different internal process deadlines from the ITR program to meet.	YES

8. Discuss any issues identified by the COV concerning the quality and effectiveness of the program’s use of merit review procedures:

In summary, the merit review process was followed well in terms of number of reviewers and panels, turn around time, quality of reviews and panel summary feedback. The system was challenged by the multidisciplinary nature of the ITR program in that it required management across organizational boundaries within NSF outside of the normal NSF procedures. The standard merit review process itself was potentially less robust for multidisciplinary proposals for which fewer experts from any particular discipline were included in the panel or provided a review. And lastly, perhaps due to the sheer volume of proposals and the lack of dedicated NSF staff for processing, some of the feedback to Principal Investigators was inadequate: particularly in review analysis forms where often a simple "boiler-plate" letter was provided.

The Conflict of Interest (COI) rules were also a source of inefficency and potential source of concern in limiting the quality of the review process. COI practices might be modified to allow a greater number of qualified reviewers to assist with the process.

On another systematic concern, conflict-of-interest rules made it difficult to recruit appropriate numbers of high-quality reviewers and panelists, especially in the Large category. In order to ensure a high quality review panel, several panelists from foreign countries were included in the panel. We believe that creative approaches to gathering non-conflicted pools of appropriate experts may have to be implemented in the future for handling the density of reviews that were seen in the ITR program. Also, we recommend, for increasing the pool of competent reviewers and the quality of reviews, the exploration of the possibility of allowing "review with disclosure of conflict" or "disclosure of influences." This approach would allow for the collection of reviews that could be viewed as "signal + influence"--that is a signal about the characterization of quality and impact of proposed work that is explicitly calibrated and weighted by non-conflicted panels, and other integrators of feedback, disclosure with a consideration of the conflicts or influences.

Review with disclosure has been done more commonly, and with apparent success, in the social sciences. NSF should deliberate about the prospects for allowing for the acquisition of "signals + conflict" as a source of valuable information. While on this topic, we point out that the NSF might also seek to better understand influences that are not labeled as "conflicts" by allowing reviewers to disclose potential influences, perhaps allowing them, in addition to enabling the entry of general comments, to select from a set of categories, such as "competitive with my own research," a common situation among academics leading high quality research 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[3]
1. Have the individual reviews (either mail or panel) addressed both merit review criteria? Comments: Both merit review criteria were addressed in 68% of the small proposals, 67% of the medium proposals and 82% of the large proposals [reference – Table A.2.a]. The reviewers in most of the proposals addressed the intellectual merit. The broader impact was emphasized more in the large proposals and the reviewers more consistently addressed this in the larger proposals as well. In general, however, it was observed more emphasis and importance seem to have been placed on the intellectual merit than on the broader impacts. Given that NSF claims that both are equally important and not mutually exclusive, it would be beneficial to the process if both criteria were addressed with equal substance and degree of feedback to the investigator(s)	YES
2. Have the panel summaries addressed both merit review criteria? Comments: All of the panel summaries for the medium and large panels addressed both merit review criteria. However, only 7 of 12 panel summaries addressed both merit review criteria for the small proposals [reference – Table A.2.2]. In general, however, it was observed more emphasis and importance seem to have been placed on the intellectual merit than on the broader impacts. Given that NSF claims that both are equally important and not mutually exclusive, it would be beneficial to the process if both criteria were addressed with equal substance and degree of feedback to the investigator(s)	YES
3. Have the *review analyses* (Form 7s) addressed both merit review criteria? Comments: The review analyses for all of the large proposals and all of the small proposals addressed both merit review criteria and ten of eleven for the medium proposals addressed both merit review criteria [reference – Table	YES

[3] In "Not Applicable" please explain why in the "Comments" section.

A.2.3]. This was a considerable improvement compared to previous years. More often than not, the review analyses focuses on the intellectual merit of the proposal. Even when the broader impacts are mentioned, in the majority of the cases is done vaguely. Furthermore, rarely broadening participation and benefits to underrepresented minorities was even addressed in the review analyses.	

4. Discuss any issues the COV has identified with respect to implementation of NSF's merit review criteria. Both the proposals and the reviewers for all of the proposals typically address the intellectual merit review criterion. The broader impact review criterion is typically addressed in the large and medium proposals. However, the small proposals and the reviewers for the small proposals often do not address the broader impact criterion. Also, the broadening the participation part of the broader impact is often not considered by the reviewers even if there is an emphasis on this aspect in the proposal. More often than not, the review analyses focuses on the intellectual merit of the proposal. Even when the broader impacts are mentioned, in the majority of the cases this is done vaguely. Furthermore, broadening participation and benefits to underrepresented minorities was rarely even addressed in the review analyses. This was deemed to be unfortunate, since it seems to contradict statements by the Director of NSF such as: "At NSF we are committed to identifying and supporting innovative programs to broaden the participation of underrepresented minorities, women, and persons with disabilities in the science and engineering workforce …In fact, as a matter of policy, NSF returns – without review – any proposal for funding that does not address the broader impacts of the proposed work on society, including how well the activity broadens the participation of underrepresented groups." This is an area where significant improvements are needed, including that training of applicants, reviewers, and program directors and their personnel.

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**[4]

[4] If "Not Applicable" please explain why in the "Comments" section.

1. Did the program make use of an adequate number of reviewers? Comments: Every proposal received at least three reviews. We suggest there be more mail reviews.	YES
2. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: We recognize the difficulty in assembling a strong, diverse, COI-free group of reviewers when most of the renowned researchers in academia participated in the ITR competition and thus were not available to serve on the review panels. The ITR program faced major challenges in obtaining highly qualified reviews, particularly for large and medium ITR proposals. The challenges arose from several factors: • Competition for qualified reviewers for journals, conferences, and other research grant programs • Interdisciplinary proposals require peer review from researchers in multiple disciplines • ITR attracted researchers who are comfortable with and open to interdisciplinary research; such people are likely to have many collaborators, who cannot review due to COI • Conflict of interest requirements excluded many other qualified reviewers • Lack of tools for locating expertise • Panel system of reviews used mail reviews as a supplementary procedure rather than being integral to the review process. We suggest NSF should consider, and explore with legal staff, the following to alleviate some of the problems in selecting more reviewers with appropriate expertise: ▪ Compile a database of qualified reviewers in various subject areas by advanced open solicitation Use more mail reviewers who have no direct COI, that is, have not submitted proposals to the same category of competition but may be in the institution where other departments have submitted proposals to ITR in the same program category	YES
3. Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: The panels consist of a very diverse group, though they did not necessarily constitute a peer group for some proposals. A concern for diversity should not be carried out to the extent of compromising the quality of the reviews, implying that a larger set of reviewers may be needed to provide quality reviews of interdisciplinary proposals.	YES

4. Did the program recognize and resolve conflicts of interest when appropriate? Comments: The program officers followed the guidelines explicitly.	YES

5. Discuss any issues the COV has identified relevant to selection of reviewers. In addition to issues raised in Part A.3 (2), we suggest NSF should instruct and remind the reviewers about the important review criteria, namely Intellectual Merit and Broader Impact, and carefully consider these issues in their deliberation. The reviewers should also clearly and explicitly address these issues in their review.

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[5], or DATA NOT AVAILABLE
1. Overall quality of the research and/or education projects supported by the program. Comments: The quality of the projects supported by the ITR program is outstanding. The IT research and infrastructure development activities address leading edge science and education IT areas across the wide range of research fields supported by the Foundation. The 30 large ITR awards made in 2003 are compelling for their vision, scope and potential impact. The Principal Investigators as evidenced by their publication records, competitive funding histories, and proposal reviews and are among the most accomplished and respected in the country.	EXCELLENT

[5] If "Not Appropriate" please explain why in the "Comments" section.

2. Are awards appropriate in size and duration for the scope of the projects? Comments: The 2003 ITR awarded amounts are within about 15% of the requested amounts for each of the three size categories (S,M,L). For the successful proposals, this is an excellent funding level ratio and it shows a clear strategy on the part of the Foundation to invest at levels required by the proposers. In many cases, Program Managers worked with PIs to produce revised budgets and proposals that minimized the impacts of any reductions. The report of the June 2004 ITR PI meeting made it clear that with this strategy “NSF got it right!” Near-full funding of the best proposals, empowered researchers to take on higher risk challenges, with broader and deeper interdisciplinary collaboration and with more potential impact, than was previously possible with NSF core program scope and funding constraints. This funding modality and structure was enthusiastically welcomed by the academic research community. By funding proposals at a very high level but by making some prudent reductions Program Managers were able to fund additional proposals in situations where there were more highly rated proposals than the available budget would have otherwise been able to support.	APPROPRIATE
3. Does the program portfolio have an appropriate balance of: • High risk projects? Comments: Risk can be assessed in various ways, the review process is aimed at minimizing failure due to in adequate intellectual or local logistic resources, while tolerating the risk associated with innovation and emerging technologies. We perceived that 2003 ITR awards were made with the appropriate level of concern for risk of both types. Risk detected by the reviewers for the inability of the PIs to describe a clear vision with an adequate explanation of potential steps to accomplish it, led to lower review ratings and lower overall rankings by the panels. Overall the intrinsic risk associated with the nature of the work was high, particularly as increased by the interdependencies of interdisciplinary work. Very few if any awards could be characterized as ‘standard science’ or ‘more of the same’ with fully predictable outcomes. Reviews on awards frequently allude to the competency of the researchers and therefore and expectation of success, and impact, despite the uncertainty associated with specific project objectives.	APPROPRIATE

4. Does the program portfolio have an appropriate balance of: • Multidisciplinary projects? Comments: The intellectual diversity or heterogeneity of the successful ITR research teams is exceptional and truly represents hybrid research collaborations. There is a high-level of multidisciplinary projects, particularly among the large project category, among the other sizes we saw a mixture of “interdisciplinarity”. The COV was given data on the interdisciplinary nature of proposals, but these data were based on the number of proposals that were jointly funded by more than one directorate. We feel the extent to which projects cut across disciplines can be significantly underestimated by the methodology employed by the Foundation for this assessment. Even within computer science, for example, collaborations among computer engineers, computational specialists, network communication, software architecture, and human computer interaction researchers, in any combination, could be considered multi- or inter-disciplinary work. NSF should derive statistical methods to more precisely reflect the number of interdisciplinary proposals and projects.	APPROPRIATE
5. Does the program portfolio have an appropriate balance of: • Innovative projects? Comments: The COV felt that the level of innovation across the ITR 2003 awards was very high and that mail, panel and program reviews of the proposals all responded to the level of innovation appropriately in assessing the promise and potential impact of the work.	APPROPRIATE
6. Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals? Comments: The COV interprets this question as the balance of funding for Large, Medium and Small ITR awards. We felt comfortable with the number of awards in each category. The distinctions made in the ITR solicitation gave clear guidance to the research community as to the intended scope, risk level, innovation and impact expected for each funding level. The proposers responded to that with increases in those parameters with each larger category. The overhead cost of collaboration and distributed project management on the large ITR projects was recognized by the reviewers and the program, the award budgets were maintained at a level to meet those costs.	APPROPRIATE

7. Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments: The level of participation in the awards of new investigators (i.e. new to NSF funding) is reasonable relative to the success rate of PIs who previously enjoyed NSF support. Although it is not clear from the summary data made available to the COV, what the level of involvement is for the new investigators identified (i.e. are they Principal Investigators with primary responsibility, or Co-PIs with more limited involvement). And with the information available, it is also not possible to know what the level of financial involvement is for new investigators as compared to previously funded researchers—across the 2003 program. Never-the-less, the success rate of new investigators as PIs or as Co-PIs ranged from about 60% to 81% of the success rate for all funded researchers across the funding categories. Although a more detailed breakdown of new researcher roles and relative funding amounts would be useful, these data suggest that new investigators are being brought into participation in grant funded projects at a significant rate. The large ITR awards were the most successful category for new researcher involvement, which might be expected given the large scope of those projects.	APPROPRIATE
8. Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments: The geographic distribution of awards seemed fine to the COV. Principal Investigators for small and medium proposals came from about 40 states in each size category.	APPROPRIATE

9. Does the program portfolio have an appropriate balance of: • Institutional types? Comments: The 2003 ITR program received a smal percentage increase in proposals from Minority Serving Institutions over 2001-2002, but the actual number of proposals (77) from Minority-Serving Institutions remained low when compared to the number from non-Minority Serving sources (2362). The success rate for proposals involving Minority-Serving Institutions is significantly lower than that for proposals from other Institutions for small and medium size cataegories (68 small and medium proposals submitted). The proposal sucess rate for Minority-Serving Institutions increased slightly over the three years but there is a large variance among years and among size classes because of the relatively small number of proposals submitted. In terms of Institutional Type, Research-Intensive (RI) PhD Institutions dominate with 75% of the proposals submitted over other 2-4 year and/or non-research intensive institutions. RI PhD Institutions dominate all categories in the number of awards in 2003 across the three size levels, and in terms of funded amounts to RI institutions. NSF should have target metrics with which this question could be unambigously evaluated for each program. The COV felt that this imbalance reflected the problems faced in Minority-Serving Institutions-heavy teaching loads limit the time available for research and grant proposal development. The NSF should consider ways of aiding institutions in proposal preparation.	APPROPRIATE
10. Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments: The COV thought the balance of proposals that integrated research and education was good. The large ITRs were probably the best of the three classes for this characteristic. We saw evidence during the jacket review of REU supplements requests for additional education activities.	APPROPRIATE
11. Does the program portfolio have an appropriate balance: • Across disciplines and subdisciplines of the activity and of emerging opportunities? Comments: This is where the ITR program soars. Although we could identify gaps in specific subdisciplines, such as cognitive science and psychology, overall the mix and coverage among disciplines was excellent.	APPROPRIATE

12. Does the program portfolio have appropriate participation of underrepresented groups? Comments: The statistics do not present a clear picture of underrepresented groups in the program because the number of PI's of "unknown" status is large. In 2003, at least 3-5% of the PI's are known to have minority status and the fraction could be somewhat larger. The ratio of rejection to acceptances is similar but the statistical precision is too low to make a meaningful statement. It is clear that no significant advantage has been conferred on the minority PI's. We also have no data on the "available" pool of potential minority PI's so we cannot tell whether the program has the appropriate representation. The main challenge in expanding minority representation is on the "supply side." It was noted by the committee that minority PI's frequently teach at institutions that impose high teaching loads. This puts potential PI's at a disadvantage both in having time to write proposals and in having time and resources to develop the research interests and expertise to succeed in the competitions. In 2003, the award rate for women in the small and medium proposal category exceeded the award rate for men and typically ran about 15%. Again here, the picture would be clearer if the NSF also provided statistics on the composition of the pool of IT professionals for comparison. However, we acknowledge that the multidisciplinary nature of the program makes that very difficult. Meaningful comparisons can be made at least for the IT-oriented proposals.	INSUFFICIENT DATA

13. Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. Comments: This program clearly addresses national priorities. The National Science Foundation Act of 1950 directs NSF to support: • Basic scientific research and research fundamental to the engineering process, • Programs to strengthen scientific and engineering research potential, • Science and engineering education programs at all levels and in all fields of science and engineering, and • An information base on science and engineering appropriate for development of national and international policy. Clearly the objectives of the interdisciplinary ITR program are aligned with this and specifically address the "all fields of science" intent of the act. The 2003-2008 strategic plan for NSF identifies four organizational goals: **(1) "People Goal** – A diverse, competitive, and globally-engaged U.S. workforce of scientists, engineers, technologists and well-prepared citizens" ITR is a highly-competitive, balanced research and education initiative that has brought together, researchers, students, minorities, women into new modes and models of collaboration and professional development. ITR PIs have strongly praised the funding and program structure as a breakthrough in the funding of much-needed interdisciplinary research. ITR 2003 did a reasonable job in attracting proposals from Minority-Serving Institutions and from women, but it can do more. **(2) "Ideas Goal -** Discovery across the frontier of science and engineering, connected to learning, innovation and service to society" ITR is unquestionably among the top programs at NSF for fostering innovation at the frontiers of science. Its tolerance for high-risk proposals and preference for novel interdisciplinary approaches is a home-run for eliciting and funding new discoveries and impacts. **(3) "Tools Goal** – Broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation" The design and implementation of state-of-the-art tools for the nation's research cyberinfrastructure is the heart, the core, of the ITR program. ITR 2003 awards exemplify the value and investments that NSF is making in the development of a globally competitive research infrastructure for discovery and learning. **(4)** "**Organizational Excellence Goal** –An agile, innovative organization that fulfills its mission through leadership in state-of the-art NSF's strong emphasis on peer review and community oversight is an organizational trait that permeates the project evaluation and award process of ITR and other programs. The adjustments that ITR made through the years were good, the request for project management plans starting in 2003, in 2002 started the involvement of divisions outside of the CISE program areas. The automation of proposal processing with Fastlane and the internal handling with the e-jacket process are very good and improving each year.	APPROPRIATE

14. Discuss any concerns relevant to the quality of the projects or the balance of the portfolio.

See comments throughout above.

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

1. Management of the program.
Comments:
The plan for handling ITR workflow and goals appeared to be thoughtful and well-organized. For example, in 2003, deadlines for the submission of proposals for Small, Medium, and Large grants were staggered so as to ensure that there was appropriate time for the review of the Large proposals. This reportedly helped to ensure the allocation of greater amounts of time to the Large grants, where problems with time had been noted in prior years of ITR proposal management.

We believe that, overall, the NSF did well to implement a new set of cross-group, coordinative activities in response to the ITR initiative. With ITR, thousands more proposals were processed through the system than would have been expected in non-ITR years. Proposals were processed in a relatively timely manner. However, gaps in the quality of reviews and meta-reviews were seen. This is likely due to a combination of difficult challenges, including a continuing issue with recruiting less than sufficient numbers of participating, non-conflicted reviewers, and lack of time and energy by panels, reviewers, and staff in light of the upswing in density of proposals that came with the ITR program.

In summary, the size and interdisciplinary nature of the program created challenges for NSF which it generally handled well. Wisely, proposals of different sizes were handled in different manners. While small proposals were accepted and handled by any appropriate division, medium and large proposals had to be submitted to the CISE Division for initial handling. However, the sheer unexpected volume of proposals created a difficulties in the system. A large number of staff had to be, in effect, "borrowed" from other divisions. While these people were incredibly dedicated, there is a need for staff to be formally dedicated to the particular program when it is so large.

2. Responsiveness of the program to emerging research and education opportunities.
Comments:
The accepted proposals seem to represent an interesting mix of research and education opportunities, as framed by the 1999 PITAC study groups recommendations. As background, in February of 1999, the President's Information Technology Advisory Committee (PITAC) issued a report emphasizing a vital national interest in IT and recommending an increase in the national commitment to long-term information technology research. NSF was designated as the lead agency within the U.S. Government for coordinating such research. The ITR program which resulted addressed important issues in bringing IT research to bear on issues in multiple disciplines beyond computer science and engineering (CS&E). The result will almost certainly be a heightened awareness of the potential for IT in other disciplines, possible expansions of those disciplines to include issues in the new technologies, and heightened knowledge in the CS&E community of research problems that address those other disciplines.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.
Comments:
The planning and prioritization process as specified in the 2003 management plan seemed to be sufficiently broad and open to identifying proposals with the promise of having broad intellectual impact and impact on involvement by diverse groups. As noted above, the original plan drew heavily from recommendations of PITAC. To paraphrase from the report for FY 2003, the ITR plan, while continuing support of previously targeted areas, emphasized the fundamental relationship between the acquisition of knowledge and the information tools needed to acquire that knowledge. The intent was to stimulate inter-disciplinary research on the fundamental challenges facing the continued expansion and utilization of IT across science and engineering, its interaction with society at large, and the use of IT to enhance security and reduce the vulnerabilities of our society to catastrophic events, whether natural or man-made. The increased emphasis on interdisciplinary opportunities will amplify the benefits of IT in all areas of science and engineering and spur progress across the national economy and society. Thus the intellectual foundation of the program was based on excellent external and internal planning

The volume of proposals caused significant difficulties in the process. We understand that fund allocations overall were predetermined. The problem with this kind of approach is that it is not adaptive enough.

4. Additional concerns relevant to the management of the program.

See comments throughout above.

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

Comments:
Overall the integrative, interdisciplinary nature of a many of the winning proposals provides promises to promote the ongoing education and broadening of the collaborating scientists, engineers, and technologists. The challenges being addressed often spanned interesting mixes of theory and practice, with tentacles of applicability extending into the real-world to promise potential influence on such challenges as the current perceived threat to our nation of ongoing asymmetric warfare.

We believe that the program could have worked more diligently to seek more successful participation by underrepresented minorities and women. We concur with findings of the National Science Board Committee on Education and Human Resources (EHR) study on "*Broadening Participation in Science and Engineering Research and Education*" of August 2003. The study highlighted deficiencies in participation in the science, technology, engineering, and mathematics workforce by underrepresented minorities, and recommended that NSF programs should: "…provide incentives and rewards to institutions that pursue or have implemented creative organizational strategies to advance underrepresented minorities into the professoriate, using legally permissible strategies." The study also stressed the need to break a potential vicious cycle of uninvolvement, stating that, "low numbers of underrepresented minority science and engineering faculty impede the recruitment and retention of underrepresented minority students in science and engineering programs."

The data in the Chart in Appendix A4.12 pertaining to the appropriate participation of underrepresented group stresses that the ITR program could have done better to involve underrepresented minorities and women in solicitations and awards.

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

Comments:
One of the largest impacts of the ITR program has been the collaboration of computer scientist and engineers with scientist and engineers from other disciplines to explore the application of information technology to numerous problems of interest to humanity, the economy, medicine, biology, genetics, geology, enabling systems for handicapped individuals, the environment, etc. Some of these efforts are likely to lead to long-term research programs such as bioinformatics.

Overall, the ITR program has had a very significant impact on the focus of research on information technology to multidisciplinary problems rather than on narrowly focused research on expanding the capability of information technology systems.

The CISE Directorate of NSF has been reorganized and this reorganization was influenced by the impact of the ITR program.

The following exemplify the nature of interdisciplinary research promoted by the ITR program:

1. Bernard Moret and his colleagues at the University of New Mexico are developing a **National Resource for Phyloinformatics and Computational Phylogenetics** called **Building the Tree of Life**. The Tree of Life initiative has a goal to reconstruct the evolutionary history of all organisms. This is the primary computational grand challenge of evolutionary biology. The Cyberinfrastructure for Phylogenetic Research (CIPRES) project has a goal to establish a national resource to move the research community much closer to the realization of this initiative. It will create a forum where experimentalists, computational biologists, and computer scientists share data, compare methods, and analyze results, thereby speeding up tool development while also sustaining current biological research projects.

2. **New Directions in Predictive Learning: Rigorous Learning Machines**: Relevant to many areas of research, including epistemology (how can theories be derived from experimental data?), cognitive science, statistical analysis, machine perception, data mining, bioinformatics, time series prediction, and many other domains where laws and knowledge must be derived from empirical data.

3. **Linked Environments for Atmospheric Discovery** (LEAD), the foundation of which is a series of interconnected virtual "Grid environments," allows scientists and students to access, prepare, predict, manage, analyze, and visualize a broad array of meteorological information independent of format and physical location. This will enable significant new discoveries in atmospheric science.

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

Comments:
The ITR program has been particularly effective in providing a wide range of tools and facilities that promise to give future infrastructure support in numerous disciplines. The range can best be seen by mentioning a few examples (from about 1,170 awards over the three-year period):

<u>GriPhyN – Towards Petascale Virtual Data Grids</u> will provide a data grid to physics enabling the sharing vast amounts of data.
<u>Interaction and Participation in Integrated Land Use, Transportation, and Environmental Modeling</u> will allow planners to investigate the future impact of decisions via complex computer models using UrbanSim.
<u>Synthetic Environment for Continuous Experimentation</u> uses an agent-based computer model of the complex situations that can arise in emergency situations to study responses to disaster situations (natural or terrorism based).
<u>AMADEUS: Adaptive Real-Time Geologic Mapping, Analysis and Design of Underground Space</u> provides a tool for the construction industry to understand the nature of underground regions (e.g., factors that determine the stability and strength of the region) prior to tunneling.
<u>Tribal Law Exchange</u> will enhance access to the legal materials of the American Indian Tribal Justice system.
<u>ITR/IERI: Integrating Speech and User Modeling in a Reading Tutor that Listens</u> will provide an interactive, one-on-one system (computer on child) for helping young students with potential reading difficulties.
<u>ITR: iLearn: IT-enabled Intelligent and Ubiquitous Access to Educational Opportunities for Blind Students</u> is a system that will assist blind students in reading printed material, interacting with others, and getting online access to material.
<u>ITR: RESCUENET - Embedded In-Building Sensor Network to Assist Disaster Rescue</u> will investigate ways in which embedded sensor/transmitters will aid rescuers in identifying the situation and rescue people after a building collapse.
<u>Building the Framework for the National Virtual Observatory</u> Astronomers have accumulated vast amounts of data from previous digitized observations over various time periods. This project will make it possible for them to use data from specified regions and times instead of making new observations, thus greatly increasing the number of studies that can be performed and greatly reducing the cost of a study.

This small sample illustrates the breadth of the program. It is clear from the titles that the output of these projects will provide" broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation."

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

Comments:
The NSF staff involved in ITR has participated enthusiastically in the ITR program, and have adapted the structure and procedures to the needs of this interdisciplinary program to the extent possible within the law and organization of NSF. Management of the program is effective, and NSF program mangers are highly respected by, and responsive to, the ITR community.

The NSF staff in some cases did not have the flexibility necessary to exchange funds across Divisions and Directorates. In some cases, this lack of flexibility is incompatible with the needs of interdisciplinary research. For instance, a proposal might come into Biology with glowing reviews, but Biology may not have sufficient funds for the ITR project. Program managers have to use a co-funding arrangement with another program such as CISE to fund such a meritorious proposal.

NSF learned from experiences over the years and improved the ITR program. By 2003, for example, proposals were encourage to add up to three pages on project management to insure that collaborations across institutions were truly collaborative and that the investigators had planned how to manage these comparatively large projects. NSF also switched from a subcontract mechanism to the collaborative grant mechanism for funding joint proposals across institutions. In doing so, NSF reduced the need for extended contract discussions across institutions, and greatly reduced PI perceived inequities. NSF also appointed a staff person to be fully responsible for ITR.

Despite these excellent responses to the ITR program, the staff was overwhelmed by the response from the science community to the ITR program. There were too few NSF staff to manage the volume of proposals. The NSF had to rely on volunteer labor, that is, staff working nights and weekends beyond their job to service the ITR program. This understaffing did have impact on the program, for example, on the ability of staff to search for, locate, and persuade sufficient numbers of qualified persons to do mail review. Because the proposals were interdisciplinary, having a ready pool of qualified researchers would have made the process run more smoothly and fairly.

A question at this point is how the NSF will manage the repositories and shared interdisciplinary resources that it funded through the ITR. It does not seem that the NSF has a strategy to preserve and leverage these invaluable resources. This is an organizational question because to have "an agile, innovative organization that fulfills its mission through leadership in state-of the-art business practices" must institutionalize procedures and practices to sustain and nourish the innovative products that it creates.

It was not clear to the CoV whether or not NSF has a systematic business practice to set strategy, objectives to support those strategies and metrics that can assess NSF's (or a program's) progress toward those goals. It is assumed this process exists, but it was not shared with the CoV in any clear way. Further, some of the CoV questions seem to imply that these goals and metrics are quantified. For example, questions regarding whether or not the ITR program made awards to an appropriate balance of institution type, minority investigators or new investigators imply that a stated goal for what is appropriate exists and it should be communicated as part of all assessment processes, including CoV activities. If this management system is not in place, it is recommended that NSF institute such a "state of the art" business practice of following systematic approach to define specific metrics that support its mission and strategy and a process to assess program performance against those metrics on an annual basis.

In general, the stimulation of communication and coordination among sections and personalities at NSF from different disciplines appeared to provide healthy stimulation for the overall NSF organization. CISE and participating divisions acquired new experience with the overlay of the significant cross-group, interdisciplinary ITR program on top of pre-existing operations. The ITR experience appears to have established conduits and concepts at NSF at handling the growing importance of computation, computational principles, and information technology in all disciplines, given the explosion in computational prowess and networking.

PART QUESTIONS

1. Has the ITR Program made significant research contributions to software design and quality, scalable information infrastructure, high-end computing, workforce, and socio-economic impacts of IT?

The ITR program is the most successful interdisciplinary information technology program in NSF's history. It is supporting innovative projects that would not otherwise be supported within disciplinary programs; it is broadening the perspective of computer science as a field; it is opening up new IT fields including bio-informatics, human-robot interaction, computational medicine. The program has supported many projects bringing computer science and information technology to schools and to the public through both hands-on projects and the Web.

We do not have sufficient evidence now of whether the research contributions, given their high risk nature, will make lasting contributions, but there seems to be evidence that major impact will be felt in several areas, in particular in computer-based infrastructure for the sciences and science education (e.g., archeology artifact databases). The ITR program also has pushed computer science in new directions, e.g., the Zebranet project.

The scale of the grants enabled researchers to mine, visualize, and model huge datasets ranging from photographs of Kosovo to detailed economic data. It enabled tackling large problems ranging from global warming to economic recession to traffic jams. It provided resources to include faculty and students from underrepresented groups and multiple disciplines, and time to cross-train students for new fields and new kinds of positions using IT.

2. Has the ITR program served an appropriate role in ensuring that grantees meaningfully and effectively collaborate across disciplines of science and engineering?

The ITR program legitimized interdisciplinary IT research within computer science and the other sciences. Medium and large ITR grants were daunting management challenges. By the year 2003, NSF was requiring investigators to provide a management plan, including their plan for coordinating across sites. We do not have the evidence (such as jointly authored papers; new projects performed together) that we would need to say whether true collaboration is occurring in all projects. From the proposals, it does seem as though ITR has helped create small communities of interdisciplinary researchers. Many investigators proposed interdisciplinary courses, cross-training, collaborations with industry, and feedback from the public or other affected groups.

PART C. OTHER TOPICS

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

The ITR is an excellent program, but NSF has not had a clear strategy for the future. Some points we wish to make regarding a necessary strategy follow:

The ITR program is supporting some critical new IT-related frontier fields and areas of research that no other program at NSF has supported in the past, at least at that level or scope. Other countries have made deeper investments than the U.S. in some of these areas. For example, the ITR has supported several projects in humanoid robotics and human-robot interaction. These projects include research in several areas of computer science and other disciplines including medicine, engineering and cognitive science. The projects involve students, high school teachers, and care facilities for the elderly. These projects have made progress but there is concern about continuing investment in new areas. Thus, today, the Japanese and Europeans have invested significantly in humanoid robotics areas and are well ahead of the U.S. Robotic solutions and interactions motivated by humanoid forms and patterns of interaction promise to be important in a variety of realms, yet had not garnered focused attention in U.S. research. The same holds for many other interdisciplinary topics. It is essential that new IT-related areas be supported.

We are concerned about continuing support after the ITR program ends for products, tools and infrastructure that have acknowledged wide applicability. For instance, this continuing support is important for grid development, where due to ITR, the United States is making excellent progress, but which may lose out to work in Europe because the Europeans, with poorer technology, seem to have a better plan for ongoing support.

To capitalize on these trends in the future, researchers must be provided with mechanisms to continue the research started with an ITR grant. While it may be appropriate to assert that good research should seek follow on grants from more traditional disciplinary funding sources, this may be difficult for novel, interdisciplinary projects. There is particular concern for the maintenance of valuable tools and/or datasets that can provide value for many years past the duration of the proposal that is funded. It may be useful to think up front about downstream funding options for continuity of research, especially with regard for the maintenance of archives and tools that can be used by future researchers.

We are concerned about how the NSF will administer, foster, and defend interdisciplinary IT research across the directorates without a designated priority area, dedicated staff, and budget for this work that crosses the NSF. Thus far, the plan seems to depend on good will and intentions, but over the course of months, institutionalized structures, budgets, and procedures are likely to dominate activity. We hope the NSF will institutionalize long-term interdisciplinary work and will actively seek to create a new ITR-like priority area or program within the Foundation.

We also hope that NSF staff will be sensitive to taking direction from research leaders versus promulgating particular visions. Program mission statements can discourage some innovation by closing off avenues of work. For example: Science of Design's mission statement seems to imply that it is relevant only to software engineering and not other meanings of the design of complex projects and systems. Other agencies and priority areas have missions. A new interdisciplinary IT program should not have specific themes that change year by year, but that has an overall mission of improving IT and the cross fertilization of IT and other disciplines and education, and that meet real world problems.

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.

There is a fine balance between supporting a greater percentage of projects vs. supporting each project at higher funding level. We noted some highly rated project with budget cut by 25%, which forced the PI to make some decisions that can potentially impede training and the research. For example, instead of hiring a part time staff person, the PI's (minority) grad RA will be doing mundane programming, taking time out of this person's research time. Cutting years is also problematic. ITR research is risky and takes time to develop. It takes ITR researchers time to learn how to run these interdisciplinary projects. They need time to cross-train students, to develop a coordination infrastructure and manage a research team, to learn and appreciate one another's language and scientific goals in more than a superficial way. Projects may only have their first breakthroughs after 3 years. Another issue is the assessment of high-risk and high-payoff projects. There is no well-defined metric. We also noted that majority of the awarded research team are multidisciplinary and the research problems require inter-disciplinary approaches to address the problems. A challenging question is how to ensure basic scientific problems are also addressed in each discipline as well.

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

An agency-wide issue is that the types of investigator-initiated high risk, high payoff research currently funded by the ITR program will not have a home. In the current arrangement, new ITR-like ideas from investigators that do not fit existing special priority areas or missions will need to be ramped down and divided up into smaller projects. These divisions will likely happen along disciplinary lines, because the funding is mainly through disciplinary programs. No unit, even CISE, has a primary goal of interdisciplinary IT research. Thus the concern is that large projects, especially those with big-impact outreach across the sciences and in the public interest will have no place to grow.

Should the agency propose a new ITR-like program, one lesson learned from the ITR is that such a program cannot be a five-year initiative without some strategy for longer-term support of the most successful projects and for ways to maintain the resources developed within the program. There seems to be no reason, for example, why such a program could not support interdisciplinary centers for shared resources and research up to10 years.

We also suggest that future large-scale research initiatives like ITR should have appropriately assigned NSF staffing level. The existing ITR programs have been ran and supported by existing NSF staff and program officers, who have volunteered to support the ITR program but are also overloaded with their own program workload already. The lack of appropriate level of staffing can significantly affect the overall program performance. For example, lack of appropriate post-award tracking, annual site visits and evaluation, progress tracking, etc. that is similar to the type of activities expected for large-scale, center-like programs such as STC. Continuation of post-award oversight and evaluation is important to ensure the success, wide dissemination, and broad accessibility of the ideas and tools developed under the NSF investment.

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

The COV saw many examples of successful proposals that had as their major goals to solve real world problems ranging from cattle disease to terror attacks, and/or to bring IT to other disciplines. For example, the project to support a tribal law database, though it has computer science research elements (such as how to incorporate unwritten law into the resource), is primarily meant to use information technology to promote legal research, to disseminate legal knowledge and decisions across all Indian tribes, and to make the data available to the public. As this example suggests, the ITR program demonstrated that an interdisciplinary large-scale program with real world applications of IT as a goal can be a high quality program. The ITR program did attract many excellent proposals that were well thought out and highly innovative. A major lesson learned is that such a program does not threaten the quality of science, but instead demonstrates that such a program of interdisciplinary research motivated by real world problems can succeed.

In some cases, it appeared that a better job could have been done with taking into active consideration ongoing research in industrial research labs and agencies, so as to seek complementarity of coverage of topics. Better sharing and awareness of reviewers about related efforts in the private sector and within other publicly-funded projects could have helped to ensure that public monies would be spent pursuing complementary challenges, rather than on such similar research. Beyond ensuring that key researchers doing related investigations from industry are involved on panels and in providing email reviews, we recommend that thought be given to ongoing, higher-level coordination, perhaps lower than membership on advisory boards by representatives from industry and other funding agencies.

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

The COV is a well-organized process, at least as we experienced it. The COV website was very helpful, and the meeting venues were well equipped and conveniently located. As the NSF develops its own IT, the COV should have access to better data and statistics to review programs. Many of the questions in the COV report templates require information that is not currently available in the NSF database. For example, searchable databases of project websites (for large and medium size ITR grants) and project-level data, online “jackets,” statistics on various underrepresented groups (minority, women, physically challenged PIs), the percentage of faculty members in various underrepresented groups across the country, the graduate and undergraduate students supported and their background information (gender, ethnicity, employment, etc.), better data for tracking budgets, reviewer scores, budget decisions at the project level, annual reports. It would help the subgroups to emphasize even more to the subgroups that their job is to write a report with a specific format and set of questions. A glossary of key terms and definitions, especially those used in the statistical summaries, would help. For example, what are the official definitions of “minority” and “multidisciplinary?”

The issue of “broader impacts” can be confusing. Some members of the COV include broad participation within the definition whereas it seems the NSF does not. This problem may be due to the lack of alignment between the GPRA goals and the merit requirements. GPRA includes people (training/outreach), ideas, and tools whereas the merit requirements include intellectual/scientific merit and broader impact. How to these two category systems map to each other? The COV highly recommends that NSF host a centralized website that provides links to all the ITR project websites for large and medium size grants. These websites will serve as (1) a public form of dissemination of ideas and tools developed under the NSF ITR grants; (2) a way of tracking the personnel and students involved in the NSF supported ITR projects; (3) a mean of publicizing the intellectual contributions and academic excellence of the NSF supported ITR projects.

MEMORANDUM
DIRECTORATE FOR COMPUTER AND INFORMATION SCIENCE AND ENGINEERING (CISE)

To: Peter A. Freeman, Office of the Assistant Director, CISE

From: Suzi Iacono & Steve Meacham, ITR COV Planning Committee Co-Chairs

Re: Demographics of the ITR COV

The ITR COV was held at the National Science Foundation on March 8-10, 2005. Here is information about the demographic composition of the COV and procedures for handling conflicts of interest and confidentiality.

Demographic Characteristics of COV (out of 35 member):

Gender: 13 females; 22 males.
Geographic Distribution: Northeast: 3; Mid-Atlantic: 6; South: 10; Mid-west: 6, West: 10.
Minority Representation: 4 African Americans; 2 Hispanic Americans; 2 African American-Hispanic Americans; 1 Asian American; (1 American Indian was invited and accepted the invitation, and then became ill the day before the COV).
Academic Institutions: Public: 24; Private: 8
Federal Labs: 1
Businesses: 2 large
ITR awardees: 12 ITR awardees
No submission to ITR in past 5 years: 14
Not currently sitting on an NSF AC: 26

Conflicts of Interest and Confidentiality:

The top page of the ITR COV website covered conflicts-of-interest and confidentiality requirements. Members of the COV were instructed to read those requirements before reading any other COV materials. The introductory session of the COV meeting included a briefing on conflicts of interest and a review of confidentiality requirements. All COV members signed the NSF Form 1230P. COV members were urged to discuss any issues or questions with the many NSF staff present at the introductory sessions. COV team leaders were told to alert NSF staff if any questions arose during their discussions. The procedure for random selection of awards and declines to be reviewed by the COV set aside those jackets that were known to include NSF IPAs. The procedure also attempted to set aside awards and declines of members of the COV, whether they were PIs or co-PIs. It was not possible in some instances because in the case of ITR large awards, for example, the population of awards for a given year was small and we wanted every COV member to read one large award. Our solution was to divide the COV into three sub-teams with a team of 10 or 11 members covering each year of the COV. (The chair and two co-chairs did not read jackets.) No COV member was put into a year when they had submitted an ITR proposal (whether it was randomly selected for COV review or not.) There was one exception to that rule. One COV member had submitted every year to ITR. She was put into the year when she received an award and no decline. That award was not included in the random selection of jackets. The selection of jackets did include some for which ITR COV members had institutional conflicts, but they did not review those jackets. The selection of jackets also included some for which ITR COV members had been reviewers, but they did not review those jackets.

Short Biographies for ITR COV Members
ITR COV
March 8-10, 2005

Winser E. Alexander

Dr. Winser E. Alexander received the BS Degree in Electrical Engineering from North Carolina A & T State University in 1964. He received the MS Degree in Engineering in 1966 and the PhD in Electrical Engineering in 1974 from the University of New Mexico. He is a currently Professor of Electrical and Computer Engineering at North Carolina State University. He previously served as an officer in the US Air Force; he was a Member of Technical Staff at Sandia Laboratories, Albuquerque, NM; and he was previously Chair of the Department of Electrical Engineering at North Carolina A & T State University, Greensboro, NC. His research interests include genomic signal processing and the design of parallel algorithms and special purpose computer architectures for digital signal processing, image processing and communication systems. Dr. Alexander is a member of IEEE, ASEE, Sigma Xi, NSPE and he is a registered as a professional engineer in North Carolina.

Susan R. Atlas

Dr. Susan R. Atlas is Research Associate Professor of Physics and Astronomy at the University of New Mexico, a Member of the UNM Center for Advanced Studies, and an Associate Member of the Cancer Research and Treatment Center (CRTC) Cancer Biology Program. Atlas is founding Director of the interdisciplinary UNM CRTC Shared Resource for Bioinformatics and Computational Biology. Previously, she served as Associate Director for Science and Engineering Research at the UNM High Performance Computing Education and Research Center (1998-2002). She received her BA in Mathematics and Physics with highest honors from Queens College, City University of New York (1979), the MA in Physics (1981) and doctorate in chemical physics (1988), both from Harvard University, supported by a National Science Foundation three-year fellowship. She has held Postdoctoral Fellowship and Affiliate appointments at Los Alamos National Laboratory's Center for Nonlinear Systems and Chemical and Laser Sciences Division (1988-1990) and the LANL Advanced Computing Laboratory. For several years she was a Scientist at Thinking Machines Corporation (1990-1994). She is involved in collaborative research to develop and apply novel pattern recognition techniques using control theory, neural networks, evolutionary algorithms, and physics-based modeling to the development of a molecular taxonomy of leukemia (research supported by NIH/NCI), and the reconstruction of complex DNA damage response and repair subnetworks in the model organism *S. Cerevisiae* (research supported by NSF).

Shenda Baker

Dr. Shenda Baker received her BS in Chemistry and French from Grinnell College in 1985. After receiving her PhD in 1991 in Chemistry from the California Institute of

Technology, she took a postdoctoral position at the Los Alamos Neutron Scattering Center. In 1993, Dr. Baker became the Clare Boothe Luce Assistant Professor of Chemistry at Harvey Mudd College where she received tenure in 1999 and full professor in 2004. She took her sabbatical year at the Department of Polymer Science and Engineering at the University of Massachusetts. In 1996, Dr. Baker was awarded a NSF CAREER Award, the DOE Young Scientists and Engineers Award and the Presidential Early Career Award for Scientists and Engineers. She served on a DOE Basic Energy Sciences Advisory Committee subpanel to help guide the future of neutron scattering facilities in the US. She currently sits on the Executive Committee for the National Neutron Scattering Society of America. She is active on the Advisory Committee to the NSF Directorate of Math and Physical Sciences as well as the Advisory Committee to the NSF Directorate of Computer and Information Science and Engineering. Currently, she chairs a Materials Research Society (MRS) committee charged with the development of outreach programs associated with a traveling educational exhibit (*Strange Matter)* aimed toward 5th - 8th graders and she chairs the current Fall 2004 MRS Symposium on "Communicating Science in the 21st Century."

James H. Beach

Dr. James H. Beach received his BS Degree in Botany from Michigan State University in 1976. He earned his PhD at the University of Massachusetts in 1983 in Botany. He was an NSF postdoctoral fellow in environmental biology at Rutgers University and at the Missouri Botanical Garden. He has held technical and administrative positions in museum computerization at Harvard University and at UC Berkeley. Beach was also the program manager for NSF's Biological Database Activities Program and worked for one year with the USGS National Biological Information Infrastructure program. He is currently assistant director for informatics at the University of Kansas Biodiversity Research Center and also serves as president of the JRS Foundation, a $40M philanthropic organization supporting environmental informatics research. Beach has worked for 20 years on research and development of internationally-recognized software applications and cyberinfrastructure for the research utilization of biological museum data, and has contributed to many research community collaborations and international projects.

Francine Berman

Dr. Francine Berman directs the San Diego Supercomputer Center (SDSC), an organized research unit of the University of California, San Diego (UCSD). In 2003, Dr. Berman was appointed the first holder of the Endowed Chair in High Performance Computing at UCSD's Jacobs School of Engineering where she also serves as Professor of Computer Science and Engineering. She founded the UCSD Grid Computing Laboratory (now the Grid Research and Innovation Laboratory) and is a Fellow of the Association for Computing Machinery. Dr. Berman's academic research during the past two decades has focused on Grid and high-performance computing, in particular in the areas of programming environments, adaptive middleware, scheduling, and performance prediction. She is one of two principal investigators of the National Science Foundation-supported TeraGrid, the largest coordinated Grid deployment project to date. Dr. Berman has also led or co-led the AppLeS (Application-Level Scheduling) Project, the design and development of adaptive middleware for Grid environments, and the large NSF "Virtual Instrument/MCell" Information Technology Research project. The editors of BusinessWeek magazine recognized Dr. Berman in May 2004 as one of the top women in technology.

Brian Bershad

Dr. Brian Bershad is an Associate Professor of Computer Science at the University of Washington,and works in computer systems analysis, operating systems, distributed systems and architecture. While at the University of Washington, Brian founded and served as CEO andChairman at Appliant, Inc. He received his Bachelor's Degree (1986) in Electrical Engineering and Computer Science from the University of California at Berkeley. He received his MS(1989) and PhD (1990) degrees in Computer Science from the University of Washington. Prior to his appointment in Seattle, he was on the faculty at Carnegie Mellon University in Pittsburgh, PA. Dr. Bershad received an NSF Presidential Young Investigator award in 1990, an ONR Young Investigator Award in 1994, and an NSF Presidential Faculty Fellow Award in 1994. He is a member of the IEEE and ACM.

Joel N. Butler

Dr. Joel N. Butler is an experimental high-energy physicist. He received a BA in Physics from Harvard University in 1969 and a PhD in Physics from Massachusetts Institute of Technology in 1975. He has been a member of the staff of the Fermi National Accelerator Laboratory, Batavia, Illinois since 1979. He currently holds the position of Senior Research Scientist. During his tenure at Fermilab, he has been head of the Electrical Support Department, the Beams Operation Department, and the Beamline Controls Department. From 1981 to 1985, he was the designer and project manager for the construction of the world's highest energy electron/photon beam. From 1980-1994, he served as co-spokesperson of an experiment to study the photoproduction of particles containing charmed quarks. From 1991-1993 he served as Associate Head and then Deputy Head of the Computing Division. From 1994-1998 he was Head of the Computing Division. From 1998 until recently he was co-spokesperson and project leader of the BTeV experiment. He is currently working on the Fermilab effort on the Compact Muon Solenoid experiment that will run at the Large Hadron Collider at CERN in Geneva, Switzerland. Dr. Butler is currently a member of the High Energy Physics Advisory Panel (HEPAP) of the US Department of Energy. He is a member of Phi Beta Kappa and a Fellow of the Division of Particles and Fields of the American Physical Society.

Oscar H. Criner

Dr. Oscar H. Criner is an applied mathematician and computer scientist. He received his BS degree from Howard University in mathematics with a minor in physics, and his

PhD degree from the University of California at Berkeley in Applied Mathematics. He began his career as an applied mathematician in defense industry companies and government laboratories. He has been a software product developer in the financial, human services, and the health care industries. He is a consultant on software product quality and other information technology issues. He has taught physics at Grambling State University, mathematics at California State University at Hayward, black studies at San Francisco State University, and computer science at Texas Southern University in Houston, where he is now Professor. His current research interests are in computational finance; logic, chaos and complex systems; environmental computational science; educational process improvement; and professional ethics and jury reform. Since 2002, he has become an active advocate for jury preservation and improvement and is a Co-Chair of the American Bar Association Commission on the American Jury.

Lesia L. Crumpton-Young

Dr. Lesia Crumpton-Young serves as Professor and Department Chair of the Industrial Engineering and Management Systems Department at UCF. Prior to serving in the Department Chair position at UCF, she held the position of Associate Dean of Engineering at Mississippi State University (MSU) and was the developer and director of the Ergonomics/Human Factors Program and Experimentation Laboratory while there. Dr. Crumpton-Young received her BS, MS, and PhD in Industrial Engineering from Texas A&M University. She received the CAREER award from NSF, served as Principal Investigator on numerous other research projects at NSF, ONR, NASA, and DOE, and has published more than 150 scholarly publications. She has worked on many industrial research projects with companies such as UPS, IBM, Caterpillar, Intel, Garan Manufacturing, Southwest Airlines, and Lockheed Martin. She received the outstanding industrial paper award for her research entitled: *An Investigation of Cumulative Trauma Disorders in the Construction Industry* at the Seventh International Occupational Ergonomics and Safety Conference. She currently serves on the NSF Engineering Advisory Committee and the Army Science Board. She is a senior member of the Institute of Industrial Engineers, the Human Factors and Ergonomics Society, and a member of Alpha Pi Mu (Industrial Engineering Honor Society). Dr. Crumpton-Young received the 1999 Janice A. Lumpkin, Educator of the Year Golden Torch Award, from the National Society of Black Engineers, and the 1997 Black Engineer of the Year Education Award. She is the recipient of the Hearin-Hess College of Engineering distinguished professor award at Mississippi State University.

Patrick Dreher

Dr. Patrick Dreher is presently a research scientist and the Associate Director of the MIT Laboratory for Nuclear Science (LNS). This Laboratory is the largest Department of Energy university-based program in both theoretical and experimental high energy and nuclear physics in the country. In addition to his responsibilities at LNS, he also serves as the Deputy-Chair of the IT Strategic Planning and Resources Coordinating Council at MIT. Prior to his work at MIT, Dr. Dreher served as the Head of Budget and Planning for the Tevatron I Project at the Department of Energy Fermi National Accelerator

Laboratory. He is a senior collaborator in the National Computational Infrastructure for Lattice Gauge Theory Project that is a part of the US Department of Energy's SciDAC program. He is also a senior member of the Lattice Hadron Physics Collaboration. Dr. Dreher received his BS in physics with a minor in mathematics from the Rensselaer Polytechnic Institute. He then continued his studies at RPI completing both his MS in experimental nuclear physics and an MBA with an emphasis in R&D management. He obtained his PhD from the University of Illinois at Champaign-Urbana focusing on both theoretical and computational physics.

Pamela Drew

In January 2004, **Dr. Pamela Drew** was named Vice President and Deputy, Airborne Intelligence Surveillance and Reconnaissance in Boeing's Integrated Defense Systems business unit. In June 2004, Drew accepted the additional assignment of Director of Program Management for Boeing Air Force Systems programs. Drew joined Boeing in 1996, was promoted through various positions, and was named Director of M&CT in January 2001 and Phantom Works Chief Information Officer in July 2001. Drew was promoted to Vice President, Engineering and Information Technology, Phantom Works in January 2002. In January 2003, her responsibility expanded to be the Boeing Phantom Works Northwest Regional Representative. Drew is the Boeing executive focal for the US National Research Council and is now serving as Chair of the Board on Manufacturing and Engineering Design for the National Academy of Science. Drew served on the Board of Directors for HRL Laboratories, currently serves on the Engineering Advisory Council at the University of Colorado, Boulder where she completed her doctorate (1991) and master's (1987) in Computer Science and her Bachelor of Arts (1985) in Mathematics. She is currently chair of the Boeing Employee's Community Fund, which is the largest employee-owned charitable organization in the world, and serves on the Board of Directors of Washington State's Special Olympics. Drew has recently been named Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA). In the computer science area, she recently served as Co-chair of the Industrial Program of Association of Computing Machinery (ACM) SIGMOD'04 (Special Interest Group on Management of Data). Before joining Boeing in 1996, Drew was Assistant Professor in the Computer Science Department of Hong Kong University of Science and Technology. In prior experience, she led advanced software technology projects for five years in the US West Advanced Technologies group in Boulder, Colorado.

C. W. Gear

Dr. C. William (Bill) Gear is President Emeritus, NEC Research Institute, Princeton, NJ and Professor Emeritus, University of Illinois at Urbana-Champaign. He was President of the NEC Research Institute from 1992 to 2000, and Vice President of its Computer Science Research Division from 1990 to 1992. Prior to joining NEC he was Professor of Computer Science, Applied Mathematics, and Electrical and Computer Engineering at the Computer Science Department of the University of Illinois, serving as Head of the Department from 1985. In 1960-1962 he was an engineer for IBM British Laboratories, participating in the original System 360 design team. He received a BA from Cambridge (England) in 1956 and a PhD from the University of Illinois in 1960 while on a Fulbright Fellowship. In 1987-1988 he served as President of the Society for Industrial and Applied Mathematics (SIAM) and as Vice President for Publications from 1990 to 1992. He is a Fellow of the IEEE, and the American Association for the Advancement of Science. He has an honorary doctorate from the Royal Institute of Technology, Stockholm, was a recipient of the Forsythe Award of the Special Interest Group for Numerical Mathematics of the ACM, and has been elected to the National Academy of Engineering and the American Academy of Arts and Sciences.

Louis M. Gomez

Dr. Louis M. Gomez is Aon Professor of Learning Science, Professor of Computer Science at Northwestern University, and Learning Science Program Coordinator. Professor Gomez' primary interest is in working with school communities to create social arrangements and curriculum that support school reform. Along with his colleagues, Professor Gomez has brought state-of-the-art computing and networking technologies into pervasive use in urban schools to transform instruction, and support community formation. Prior to joining the Faculty at Northwestern Professor Gomez was director of Human-Computer Systems Research at Bellcore in Morristown New Jersey. At Bellcore, he pursued an active research programs investigating techniques that improve human use of information retrieval systems and techniques that aid in the acquisition of complex computer-based skills. Professor Gomez received a BA in Psychology from the State University of New York at Stony Brook and a PhD in Cognitive Psychology from the University of California at Berkeley.

Ignacio E. Grossmann

Dr. Ignacio E. Grossmann is the Rudolph R. and Florence Dean University Professor of Chemical Engineering, and former Department Head at Carnegie Mellon University. He obtained his BS degree in Chemical Engineering at the Universidad Iberoamericana, Mexico City, in 1974, and his MS and PhD in Chemical Engineering at Imperial College in 1975 and 1977, respectively. After working as an R&D engineer at the Instituto Mexicano del Petróleo in 1978, he joined Carnegie Mellon in 1979. He was Director of the Synthesis Laboratory from the Engineering Design Research Center in 1988-93. He is currently director of the "Center for Advanced Process Decision-making" which comprises a total of 15 chemical and petroleum companies. Grossmann is a member of the National Academy of Engineering, Mexican Academy of Engineering, and associate editor of *AIChE Journal* and member of editorial board of *Computers and Chemical Engineering, Journal of Global Optimization, Optimization and Engineering,* and *Latin American Applied Research.* Major awards include the 1984 Presidential Young Investigator Award, the 1994 Computing in Chemical Engineering Award of the CAST Division of AIChE, the 1997 William H. Walker Award of AIChE, in 2002 Honorary Doctor in Technology from Åbo Akademi in Finland, Fellow of INFORMS and AIChE, Top 15 Most Cited Author in Computer Science by ISI, and the recipient of the 2003

Computer Society Prize of INFORMS. He was also recipient of the Best Technical Paper in 1988, 1996, 1998 and 2000 of *Computers and Chemical Engineering*.

Robert M. Groves

Dr. Robert M. Groves is Director of the University of Michigan Survey Research Center, Professor of Sociology at the University of Michigan, Research Professor at its Institute for Social Research, and Research Professor at the Joint Program in Survey Methodology, at the University of Maryland. From 1990-92 he was an Associate Director of the U.S. Census Bureau, on loan from Michigan. From 1992-2001 he was the associate director, then director of the Joint Program in Survey Methodology, a consortium of the University of Maryland, University of Michigan, and Westat, sponsored by the Federal statistical system. He is the author of many books and journal articles in survey methodology. He is a member of the National Research Council's Committee on National Statistics; the Federal Economic Statistics Advisory Board of the Bureau of Economic Analysis, Bureau of Labor Statistics, and the Census Bureau; the advisory committee of the National Science Foundation Division of social, behavioral, and economic sciences; the expert advisory committee for the National Survey of Drug Use and Health; the board of directors of the Association for the Accreditation of Human Research Protection Programs; the executive council of the American Association for Public Opinion Research; and the steering committee of the Key National Indicators Initiative of the National Academies. Groves has an AB degree from Dartmouth College and a PhD from the University of Michigan. He is a fellow of the American Statistical Association, an elected member of the International Statistical Institute, former President of the American Association for Public Opinion Research, former Chair of the Survey Research Methods Section of the American Statistical Association, and a winner of the 2000 AAPOR Innovator Award. In 2001 Groves was awarded the distinguished achievement award, the AAPOR award, by the association.

Eric Horvitz

Dr. Eric Horvitz is a Senior Researcher and Research Group Manager at Microsoft Research. He oversees the Adaptive Systems and Interaction group, a team pursuing basic and applied research in decision-making, intelligent systems, machine learning, and human-computer interaction. He is Chairman of the Association for Uncertainty and Artificial Intelligence (AUAI), the Area Editor of the Decisions, Uncertainty, and Computation section of the Journal of the ACM, and has been elected a Fellow and Councilor of the American Association for Artificial Intelligence. He is a member of the Naval Research Advisory Committee (NRAC) and recently completed a term of service on the Information Science and Technology Study Group (ISAT) of DARPA. He received his PhD and MD degrees at Stanford University, focusing in his doctoral work on principles of computation and action under bounded resources.

More information can be found at: http://research.microsoft.com/~horvitz

Mary Jane Irwin

Dr. Mary Jane (Janie) Irwin has been on the faculty at Penn State since 1977 where she currently holds the title of A. Robert Noll Chair in Engineering in the Department of Computer Science and Engineering. Her research and teaching interests include computer architecture, embedded and mobile computing systems design, power aware design, and electronic design automation. Dr. Irwin received her PhD degree in computer science from the University of Illinois in 1977. She received an Honorary Doctorate from Chalmers University, Sweden, in 1997 and the Penn State Engineering Society's Premier Research Award in 2001. She was named a Fellow of The Institute of Electrical and Electronic Engineers (IEEE) in 1995, a Fellow of The Association for Computing Machinery (ACM) in 1996, and was elected to the National Academy of Engineering (NAE) in 2003. Dr. Irwin is currently serving as a member of the Technical Advisory Board of the Army Research Lab, on ACM's Publications Board, and as the Editor-in-Chief of ACM's *Journal on Emerging Technologies in Computing Systems (JETC).* In the past she has served as an elected member of the Computing Research Association's Board of Directors, IEEE Computer Society's Board of Governors, of ACM's Council, and as Vice President of ACM.

Sara Kiesler

Dr. Sara Kiesler is Hillman Professor of Computer Science and Human Computer Interaction at Carnegie Mellon University. Prof. Kiesler applies behavioral and social science to technology design and to understanding how technology changes individuals, groups, and organizations. She conducted among the first scientific studies of computer-mediated communication. With Lee Sproull, she authored “Connections: New Ways of Working in the Networked Organization” (MIT Press). She has collaborated extensively within CMU and with colleagues elsewhere on social aspects of the Internet (“Culture of the Internet,” Erlbaum). She continues to study the social impact of the Internet on families, problems associated with multidisciplinary and complex forms of collaboration, geographically dispersed science and project work (“Distributed Work,” MIT Press), information sharing, and the design of human-robot interaction.

Maria M. Klawe

Dr. Maria M. Klawe is currently Dean of Engineering and a professor of Computer Science at Princeton University. She moved to Princeton in January 2003 from the University of British Columbia where she served as Dean of Science from 1998 to 2002, Vice-President of Student and Academic Services from 1995 to 1998, and Head of the Department of Computer Science from 1988 to 1995. Prior to UBC, Maria spent eight years with IBM Research in California, and two years at the University of Toronto. She received her PhD (1977) and BS (1973) in Mathematics from the University of Alberta. Maria is currently Past President of the Association of Computing Machinery (ACM) in New York, Chair of the Board of Trustees of the Anita Borg Institute for Women and Technology in Palo Alto, and a Trustee of the Institute for Pure and Applied Mathematics in Los Angeles and the Mathematical Sciences Research Institute in Berkeley. She was one of the founders and is currently Chair of the Board of Silicon Chalk, a Vancouver-based company producing software to support interactive learning and collaboration in classes where each student has a computer (see www.siliconchalk.com). In the past Maria has held leadership positions in the American Mathematical Society, the Computing Research Association, the Society for Industrial and Applied Mathematics, and the Canadian Mathematical Society. Maria was elected as a Fellow of the Association of Computing Machinery in 1995. Other awards include Vancouver YWCA Women of Distinction Award in Science and Technology (1997), Wired Woman Pioneer (2001), Canadian New Media Educator of the Year (2001), BC Science Council Champion of the Year (2001), University of Alberta Distinguished Alumna (2003), Nico Habermann Award (2004), and honorary doctorates from Dalhousie University (2005), Queen's University (2004), the University of Waterloo (2003), and Ryerson University (2001).

Ming C. Lin

Dr. Ming C. Lin received her BS, MS, PhD degrees in Electrical Engineering and Computer Science in 1988, 1991, 1993 respectively from the University of California, Berkeley. She is currently a full professor in the Department of Computer Science at the University of North Carolina (UNC), Chapel Hill. She received several honors and awards, including the NSF Young Faculty Career Award in 1995, Honda Research Initiation Award in 1997, UNC/IBM Junior Faculty Development Award in 1999, UNC Hettleman Award for Scholarly Achievements in 2002, and best paper awards at Army Science Conference 1996, Eurographics 1999, Eurographics 2002, and ACM Symposium on Solid Modeling and Applications 2003. She was the organizer, general chair and/or program chair of several conferences, including the ACM Workshop on Applied Computational Geometry 1996, ACM Symposium on Solid Modeling and Applications 1999, Workshop on Intelligent Human Augmentation and Virtual Environments 2002, ACM SIGGRAPH / EG Symposium on Computer Animation 2003, ACM Workshop on General Purpose Computing on Graphics Processors 2004, Eurographics 2005, Computer Animation and Social Agents 2005. She also serves on the Steering Committee of ACM SIGGRAPH/Eurographics Symposium on Computer Animation. She has served as an associate editor or guest editor of several journals and magazines, including IEEE Transactions on Computer Graphics and Visualization, the International Journal on Computational Geometry and Applications, IEEE Computer Graphics and Applications, and ACM Computing Reviews in Computer Graphics. She also co-edited the book "Applied Computation Geometry".

Larry Mayer

Dr. Larry Mayer has a broad-based background in marine geology and geophysics. He graduated magna cum laude with an Honors degree in Geology from the University of Rhode Island in 1973 and received a PhD from the Scripps Institution of Oceanography in Marine Geophysics in 1979. At Scripps his schizophrenic future was determined as he worked with the Marine Physical Laboratory's Deep-Tow Geophysical package, but applied this sophisticated acoustic sensor to problems of the history of climate. After being selected as an astronaut candidate finalist for NASA's first class of mission specialists, Larry went on to a Post-Doc at the School of Oceanography at the University of Rhode Island. In 1982, he became an Assistant Professor in the Dept. of Oceanography at Dalhousie University. In 1991 he moved to the University of New Brunswick to take up the NSERC Industrial Research Chair in Ocean Mapping. In 2000 Larry became the founding director of the Center for Coastal and Ocean Mapping at the University of New Hampshire and the co-director of the NOAA/UNH Joint Hydrographic Center. Larry has participated in more than 60 cruises (over 50 months at sea!) during the last 20 years and has been chief or co-chief scientist of numerous expeditions including two legs of the Ocean Drilling Program. He has served on, or chaired, far too many international panels and committees and has the requisite large number of publications on a variety of topics in marine geology and geophysics. He is the recipient of the Keen Medal for Marine Geology and an Honorary Doctorate from the University of Stockholm. He was a member of the President's Panel on Ocean Exploration and chaired a National Academy of Science Committee on national needs for coastal mapping and charting. He is a member of the NOAA's Hydrographic Services Review Panel and a member of the National Science Foundation's Advisory Committee for the Geosciences.

Peter McCartney

Dr. Peter McCartney is Research Professor in the International Institute for Sustainability (IIS) at Arizona State University. His primary research interest is in the application of informatics solutions to human ecological research both past and present. McCartney directs the Informatics Lab at IIS, which provides data management and analytic support for several major research projects including the Central Arizona Phoenix Long Term Ecological Research project and the Decision Center for a Desert City. McCartney is PI or co-PI on several informatics research projects focusing on developing data management & access systems, metadata standards, distributed data-sharing networks, and online applications for delivering ecological, archaeological, and urban planning data. Current projects involve loose coupling of urban environmental and social models through grid services and ontology-based approaches for spatio-temporal scaling of ecological data.

Gregory A. Moses

Dr. Gregory A. Moses is Professor of Engineering Physics at the University of Wisconsin-Madison. He joined the faculty at Wisconsin in 1976 after receiving his BS, MS, and PhD degrees in Nuclear Engineering at the University of Michigan. Professor Moses does research in inertial confinement fusion and radiation hydrodynamics and in computational science in general. He has authored books on inertial confinement fusion and computer programming for engineering applications. He has published over 100 archival and conference papers. He serves as a consultant to Los Alamos National Laboratory in the area of radiation hydrodynamics. He co-led the Education, Outreach and Training aspect of the NSF PACI program for seven years, whose mission was to include people who would not otherwise have participated in the revolution of high performance computing. He has an interest in using computers for learning and heads the

Effective Teaching with Technology project within the NSF sponsored Center for Integration of Research, Teaching and Learning at the UW. He is the creator of the eTEACH software that allows presentations to be viewed on-line in a web browser and has used this software for educational reform in a large enrollment computer science course at UW. He teaches nuclear engineering and computer science courses.

Joseph E. Neigel

Dr. Joseph E. Neigel is a UL Lafayette Foundation Distinguished Professor in the Department of Biology at the University of Louisiana. He received his BA (1978) in Earth and Planetary Sciences from The Johns Hopkins University and his PhD (1984) in Molecular and Population Genetics from the University of Georgia. He was a Jane Coffin Childs Fellow at the University of California School of Medicine from 1984-1987 and a Visiting Distinguished Research Fellow at the Bodega Marine Laboratory of the University of California, Davis in 2001. Dr. Neigel's research in population genetics, molecular evolution, bioinformatics, and conservation genetics has been supported by grants from NSF, DOE, and NOAA. He has been active in promoting technologies to facilitate sharing and integration of scientific knowledge. These activities include developing a working object database that demonstrates it is possible to represent and manipulate diverse types of genetic data at a common level of abstraction, and chairing the data standards committee of the Society for the Study of Evolution. Dr. Neigel is also committed to the improvement of science education; he is a founding member of the Louisiana Alliance for Science and regularly organizes workshops to introduce high school students to scientific research. Currently Dr. Neigel serves on the editorial board of *Conservation Genetics* and is co-chairing a regional Bioinformatics symposium.

Germán R. Núñez G.

Born in Caracas, Venezuela, **Dr. Germán R. Núñez G**., came to the United States in 1968 to study Industrial Engineering. He received Bachelors and Masters degrees from West Virginia University and a PhD from Texas A&M University. He began his career in the General Electric Co. where he rose through the ranks becoming the youngest person to hold the rank of Manager of Organization and Manpower Operations of a five-country, international division. In 1984, he joined his alma mater as an assistant professor of industrial engineering. Since then he has been associate professor; and full professor of industrial and systems engineering, aerospace engineering, engineering management, bioengineering, and now, at Texas Tech Health Sciences Center he is part of the faculty as professor of physiology. As an administrator, Dr. Núñez has been Director of the Minority Engineering Program at the University of Colorado at Boulder, Vice Provost and Director of the Center for Diversity and Multicultural Affairs at Oregon Health and Sciences University, and currently serves as Vice President for Diversity and Multicultural Affairs at Texas Tech University Health Sciences Center.

Panagote Pardalos

Dr. Panagote (Panos) Pardalos is Professor of Industrial and Systems Engineering at the University of Florida. He is also an affiliated faculty member of the Computer Science Department, the Hellenic Studies Center, and the Biomedical Engineering Program. He is also the Co-Director of the Center for Applied Optimization. Dr. Pardalos obtained a PhD degree (1985) from the University of Minnesota in Computer and Information Sciences. He has held visiting appointments at Princeton University, DIMACS Center, Institute of Mathematics and Applications, FIELDS Institute, AT & T Labs Research, Trier University, Linkoping Institute of Technology, and Universities in Greece. He has received numerous awards including University of Florida Research Foundation Professor, Foreign Member of the Royal Academy of Doctors (Spain), Foreign Member of the Lithuanian Academy of Sciences, Foreign Member of the National Academy of Sciences of Ukraine, and Foreign Member of the Petrovskaya Academy of Sciences and Arts (Russia). He is a Fellow of AAAS (American Association for the Advancement of Science), and in 2001 he was honored with the Greek National Award and Gold Medal for Operations Research. He is the editor-in-chief of the Journal of Global Optimization, managing editor of several book series, and a member of the editorial board of twenty international journals. He has written numerous articles and developed several well-known software packages. The National Science Foundation, NIH, and other government organizations support his research.

John P. Robinson

Dr. John P. Robinson is Professor of Sociology at the University of Maryland, College Park, where he directs the Americans' Use of Time Project and the Internet Scholars Program. He received his doctoral degree in Mathematical and Social Psychology at the University of Michigan, with earlier degrees in mathematical statistics and actuarial science at the University of Toronto and Virginia Tech. Dr. Robinson founded and directed the Survey Research Center at the University of Maryland and the Communication Research Center at Cleveland State University. He directed the pioneering trend studies of how Americans spend time and the impact of the Internet (with main support from the National Science Foundation), as well as Americans' participation in the arts (SPPA) for the National Endowment for the Arts. He is the founding editor of *IT & Society*, an online journal documenting the impact of new information technology on society, and he developed webuse.umd.edu, a statistically interactive website that archives national surveys of Internet use in America. Dr. Robinson was an American Statistical Association/ National Science Foundation fellow at the Bureau of Labor Statistics, a Fulbright scholar at Moscow State University and Soviet Academy of Sciences, a Research Consultant at BBC News and Research Coordinator for the U.S. Surgeon General's Program on Television and Human Behavior in 1970. He received the 1987 Fordham University McGannon Award for Social and Ethical Relevance in Communication Policy Research for his research on improving public understanding of the news, and is a member of the honorary Sociological Research Association.

José E. Schutt-Ainé

Dr. José E. Schutt-Ainé received his BS degree in Electrical Engineering from the Massachusetts Institute of Technology in Cambridge, MA in 1981. After graduation, he accepted a position at the Hewlett-Packard Technology Center in Santa Rosa, California, as an application engineer for microwave transistors and high-frequency circuits. In 1983, he moved to the University of Illinois, Urbana, Illinois to pursue graduate studies in the same field and received the Masters and PhD degrees in 1984 and 1988 respectively. Upon graduation, he joined the faculty of the Electrical and Computer Engineering Department at the same institution and has since been a member of the Electromagnetics and Coordinated Science Laboratories where he has conducted teaching and research activities leading to the graduation of more than 25 Masters and PhD students. In 2001, he took a leave of absence from the University to help start Xindium Technologies, Inc. of which he was the first President and a Founder. In April 2004, Dr. Schutt-Aine returned to the University where he is now a Professor of Electrical and Computer Engineering. Dr. Schutt-Aine has been a consultant for several corporations. These include IBM, Intel, GTE, Cray, SAIC, Motorola, Raytheon, Digital Equipment Corp., Caterpillar, Teradyne, Cadence, and Lucent. He has received several research awards including the NSF MRI Award in 1991, the NASA Faculty Award for Research in 1992, the NSF MCAA Award in 1996, the CPMT-IEEE Education Award in 1998 and the UIUC-NCSA Faculty Fellow in 2000. He served as an Associate Editor of the IEEE Transactions on Circuits and Systems from 1997-1999 and is a member of the editorial board for the IEEE Transactions on Microwave Theory and Techniques.

Edward Seidel

Dr. Edward Seidel is a physicist recognized worldwide for his work on numerical relativity, black holes, and high-performance computing. He earned his PhD from Yale University in 1988. Seidel worked at the University of Illinois and led the National Center for Supercomputing Applications Numerical Relativity group for a number of years. He was a professor at the Max-Planck-Institut fuer Gravitationsphysik (Albert-Einstein-Institute) in Golm, Germany from 1996 - 2003. Seidel is currently serving as the director of the Center for Computation & Technology at Louisiana State University and Floating Point Systems Professor of Physics and Computer Science.

Lisa Cirbus Sloan

Dr. Lisa Cirbus Sloan is a Professor of Earth Sciences and the Director of the Climate Change and Impacts Laboratory at the University of California Santa Cruz. Sloan received her PhD from Pennsylvania State University in 1990; she did postdoctoral work at the University of Michigan. Sloan joined the faculty at UCSC in 1995. Sloan has been the National Secretary of the American Geophysical Union’s Ocean Sciences Section, a scientific fellow of the David and Lucile Packard Foundation, Editor-in-Chief of the international journal Global and Planetary Change, and co-chair of the National

Center for Atmospheric Research's Paleoclimate Working Group. She is currently a member of the Advisory Panel for the Scientific Computing Division at the National Center for Atmospheric Research, and she is editor of the international journal Paleoceanography. Sloan's research is concentrated in two broad areas: (1) understanding the mechanisms of past climate changes and (2) studying and modeling future climate change at regional scales and investigating the possible impacts of future climate change on human and natural systems. She has authored or coauthored more than 50 peer-reviewed articles and book chapters. For more information, see http://www.es.ucsc.edu/~lcsloan/.

William D. Smyth

Dr. William D. Smyth obtained his PhD in physics from the University of Toronto in 1990. He is now an Associate Professor of physical oceanography at Oregon State University. He won the Pattullo Award for Excellence in Teaching in 2004. His research focuses on ocean turbulence and thermohaline mixing processes, and his primary tool is direct numerical simulation of turbulent flows. He also teaches guitar, and has an avid interest in Pleistocene climatology.

Éva Tardos

Dr. Éva Tardos received her PhD at Eötvös University in Budapest, Hungary in 1984. After teaching at Eötvös and the MIT, she joined Cornell in 1989. She is a member of the American Academy of Arts and Sciences, an ACM Fellow, was a Guggenheim Fellow, a Packard Fellow, a Sloan Fellow; an NSF Presidential Young Investigator; and has received the Fulkerson Prize in 1988. She is the editor of several journals including SIAM Journal of Computing, Journal of the ACM, and Combinatorica. Tardos's research interest focuses on the design and analysis of efficient methods for combinatorial-optimization problems on graphs or networks. Such problems arise in many applications such as vision, and the design, maintenance, and management of communication networks. She is mostly interested in fast combinatorial algorithms that provide provably optimal or close-to-optimal results. She is most known for her work on network-flow algorithms, approximation algorithms for network flows, cut, and clustering problems. Her recent work focuses on algorithmic game theory, an emerging new area of designing systems and algorithms for selfish users.

Dr. Valerie Taylor

Dr. Valerie Taylor is head of the Department of Computer Science and holder of the Royce E. Wisenbaker Professorship I in Engineering at Texas A&M University. Her research interests are in the area of high-performance computing, with particular emphasis on the performance analysis and modeling of parallel and distributed applications. She has published over 80 articles in this area. Among Dr. Taylor's honors are the 2003 MOBE Influencers and Innovators of the Internet and Technology Award; the 2002 Young Outstanding Leader Award from the University of California, Berkeley, Engineering Alumni Society; the 2002 CRA A. Nico Habermann Award; 2001 Hewlett

Packard Harriet B. Rigas Education Award; and the 2001 Pathbreaker Award from the Women in Leadership at Northwestern University. She is a member of the University of California, Berkeley, College of Engineering Advisory Board and former member of NSF CISE Advisory Committee and the Executive Committee for the National Computational Science Alliance. Dr. Taylor received a BS in computer and electrical engineering in 1985 and an MS in electrical engineering in 1986, both from Purdue University. She received her PhD in electrical engineering and computer science from the University of California Berkeley in 1991.

John C. Wooley

Dr. John C. Wooley is Associate Vice Chancellor for Research at the University of California San Diego, an adjunct Professor in Pharmacology, and in Chemistry and Biochemistry, and a Strategic Advisor for the San Diego Supercomputer Center. He previously held faculty appointments at Princeton University and the Marine Biological Labs, did postdoctoral research in molecular biology at Harvard University, and received his PhD degree at The University of Chicago. Dr. Wooley created the first programs within the US federal government for funding research in bioinformatics and in computational biology. Recently, on behalf of the National Science Foundation, he has explored the requirements for building a cyberinfrastructure for the biological sciences (http://research.calit2.net/cibio). For the new UCSD California Institute for Telecommunication and Information Technology [Cal-(IT)2], Dr. Wooley directs the biology and biomedical layer or applications component, termed Digitally-enabled Genomic Medicine (DeGeM). In conjunction with the Center for Research on BioSystems (CRBS), DeGeM participates in UCSD's systems biology and translational medicine research. He is co-Principle Investigator of the Joint Center for Structural Genomics and UCSD PI for the Bioinformatics Core. To complement the research portfolio and provide alternative funding sources, Dr. Wooley created The Scholars Project (TSP), of which one early TSP contribution is the annual Spotlight edition of Scholars Serving Society, a publish-on-demand, and print-as-specified book.

Ellen W. Zegura

Dr. Ellen W. Zegura received the BS degree in Computer Science (1987), the BS degree in Electrical Engineering (1987), the MS degree in Computer Science (1990) and the DSc in Computer Science (1993)from Washington University, St. Louis, Missouri. Since 1993, she has been on the faculty in the College of Computing at Georgia Tech, where she is currently a Full Professor. She was an Assistant Dean in charge of Space and Facilities Planning from Fall 2000 to January 2003. She served as Interim Dean of the College for six months in 2002. Since February of 2003, she has been an Associate Dean responsible for Research and Graduate Programs. A long-running theme of her research work is the development of wide-area (Internet) networking services. Wide-area services are utilized by applications that are distributed across multiple administrative domains (e.g., web, file sharing, multi-media distribution). Her focus is on services implemented both at the network layer, as part of network infrastructure, and at the application layer. The work in this area falls into three categories: (1) measurement and modeling, (2) development of new services, and (3) investigation of paradigms and platforms to support new services. A recent theme of her work is the construction of disruption tolerant networks that operate in environments where communication links are subjected to frequent disruptions.

Information Technology Research
Committee of Visitors for 2001-2003

AGENDA

ITR COV for 2001-2003
March 8-10, 2005

Day One, March 8 (Tuesday):

Stafford II: Room 555

8:00 AM	Continental Breakfast
9:00 AM	Welcome remarks: Dr. Deborah Crawford (DAD/CISE), Professor Janie Irwin (ITR COV Chair); Conflict of Interest (COI), ITR Background, How to Read a Jacket: Dr. Suzi Iacono and Dr. Steve Meacham
10:30 AM	Break

Stafford II: Rooms 517 (Co-Chairs), 545 (FY01), 535 (FY02), 525 (FY03)

10:45 AM	Individual team orientation to assigned year (FY01, FY02, FY03)
11:00 AM	Read jackets
12:00 Noon	Working lunch - sandwich buffet
2:45 PM	Team discussion – planning for report writing
3:15 PM	Break

Stafford II: Room 555

3:30 PM	Executive Session to plan for report writing
4:00 PM	Welcome from Dr. Peter Freeman, AD/CISE, Dr. Mary Clutter, AD/BIO, Dr. Donald Thompson, Acting AD/EHR, Dr. John Brighton, AD/ENG, Dr. Margaret Leinen, AD/GEO, Dr. Wanda Ward, Acting AD/SBE, Dr. Michael Turner AD/MPS
4:10 PM	ITR nuggets presentations by NSF Program Officers (Part I) 4:10: Michael Foster DD CISE/CCF 4:15: Manfred Zorn PD BIO 4:20: Julie Palais PD OPP 4:25: Ken Whang PD CISE/IIS 4:30: Caroline Wardle SSA CISE/CNS 4:35: Richard Fragaszy PD ENG 4:40: Discussion

5:15 PM	Poster Session – peruse nuggets
6:15 PM	Cocktails at Matsutake Restaurant
7:00 PM	Dinner at Matsutake Restaurant

Day Two, March 9 (Wednesday):

Stafford II: Room 555

8:00 AM	Continental Breakfast

Stafford II: Rooms 517 (Co-Chairs), 545 (FY01), 535 (FY02), 525 (FY03)

9:00 AM	Read jackets
11:30 AM	Go to food court to buy lunch

Stafford II: Room 555

12:00 Noon	Lunch and ITR nuggets presentations by NSF Program Officers (Part II) 12:00 Guy Almes PD CISE/SCI 12:05 John Cherniavsky SSA EHR 12:10 Nigel Sharp PD MPS 12:15 Eric Itsweire PD GEO 12:20 Dan Newlon PD/CC SBE 12:25 Discussion
1:00 PM	Poster Session

Stafford II: Rooms 517 (Co-Chairs), 545 (FY01), 535 (FY02), 525 (FY03)

1:30 PM	Team Discussion – Feedback to the ADs and Report Writing
2:45 PM	Break

Stafford II: Rooms 517 (Co-Chairs), 545 (FY01), 535 (FY02), 525 (FY03)

3:00 PM	Co-Chairs and Teams prepare for initial feedback to the ADs in 517 Team members finish reading, continue writing in team rooms

Stafford II: Room 555

4:00 PM	All meet in Room 555 for discussion on feedback to the ADs
4:30 PM	Feedback session with Dr. Peter Freeman, AD/CISE, Dr. Mary Clutter, AD/BIO, Dr. John Brighton, AD/ENG, Dr. Margaret Leinen, AD/GEO, Dr. Michael Turner, AD/MPS, Dr. Karl Erb, Director/OPP
5:00 PM	Executive session

5:30 PM	Break
6:30 PM	Dinner (directions in your packets) FY01 Team -- Gaffney's FY02 Team -- Caribbean Breeze FY03 Team -- Tutto Bene Italian Restaurant & Grill

Day Three, March 10 (Thursday)

Stafford II: Rooms 517 (Co-Chairs), 545 (FY01), 535 (FY02), 525 (FY03)

8:00 AM	Working Breakfast: Teams write reports

Stafford II: Room 555

10:00 AM	Executive Session– if necessary

Stafford II: Rooms 517 (Co-Chairs), 545 (FY01), 535 (FY02), 525 (FY03)

10:30 AM	Teams write reports
11:30 AM	Go to food court to buy lunch
12:00 Noon	Working Lunch

Stafford II: Room 555

3:00 PM	Final Executive Session
3:15 PM	COV adjourns

Stafford II: Room 517

3:30 PM	Co-Chairs and Team Leaders finalize report
6:00 PM	Co-Chairs and Team Leaders depart

Last Modified: 03/09/2005