Training Cluster
Division of Biological Infrastructure
Charge to the Committee of Visitors (COV)

NSF relies on the expert judgment of COVs to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation.

The Charge:
You are charged to produce a report that provides an assessment of NSF's performance in two primary areas: (1) the quality and integrity of program operations and program-level technical and managerial matters pertaining to proposal decisions; and (2) the degree to which the outputs and outcomes generated by awardees have contributed to the attainment of NSF's mission, strategic goals, and annual performance goals. In addition, COV members are encouraged to comment on the COV process, format, and questions, to give feedback to NSF on how to improve in these areas, as well as program performance.

More about the COV report:
To assist COVs with their review, NSF has developed a document entitled "FY2003 **Core Questions and Report Template** to Committees of Visitors (COVs)" which will be available on the web along with other COV materials, as mentioned in the cover letter. The core questions are a basic set of questions that NSF must respond to as a whole, when reporting annually to Congress and OMB. The questions apply to the portfolio of activities representative of the program under review, as determined by the Division or Directorate. Not all core questions are relevant to all programs. COV's should comment when questions are not applicable to the program under review and explain why the goal is not applicable. In addition to the core questions, please provide answers to **Specific Questions** (also on the web) that apply to the Training Cluster.

The COV report must be completed and signed before the COV leaves town. NSF has also developed a **template for FY2002 COV report** (available on the web). At the time of COV, we will provide you with a template on a computer disk.

Specific examples which illustrate goal achievement or significant impact should be provided in the COV report, with a brief explanation of the broader significance for each, and an NSF grant number. Weaknesses should be identified. Clear justifications for ratings are critical – ratings without justifications will not be used for agency reporting purposes.

2003 Training Cluster COV
May 5-7, 2003

COV Chair	**BIO Advisory Committee Liaison**
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Composition of Committee of Visitors for the Training Cluster
Directorate for Biological Sciences

The Committee of Visitors consisted of nine members, including Dr. Thomas Brady, who represented the BIO Advisory Committee, and will report his observations to the Advisory Committee at their next meeting. Four of the COV members are female, and two members are underrepresented minority. Members currently work in six different states, including, California, Colorado, Iowa, North Carolina, Texas, and Washington, D.C. Seven of the members are from academic institutions, one is from industry and one is from government. Nine members hold the Ph.D., with the earliest degree awarded in 1966 and the most recent awarded in 1990.

Four members of the Committee have no records in the NSF PI History file over the past five years. Three members have no reviewer history. Of those members who have received NSF awards, two have currently active awards in DBI and one has a pending proposal in DBI. None of these awards are in the Training Cluster. None of the sample of proposals pulled for Committee review came from any institution with which a member had a known conflict of interest. Committee members were further instructed to avoid examination of jackets with which they had a conflict of interest or with which they had a perceived conflict of interest. In the event that the Committee was to discuss a jacket with which a member had a perceived conflict, we asked the member to advise the Committee Chair and to leave the meeting room. The Chair did not report such an event occurring.

Mary E. Clutter
Assistant Director, BIO

FY 2003 REPORT TEMPLATE FOR NSF COMMITTEES OF VISITORS (COVs)

Date of COV: May 5-7, 2003
Program/Cluster: Training Cluster
Division: Division of Biological Infrastructure
Directorate: Biological Sciences
Number of actions reviewed by COV[1]: Awards: 54 Declinations: 54 Other: 0
Total number of actions within Program/Cluster/Division during period being reviewed by COV[2]: Awards: 277 Declinations: 385 Other: 0
Manner in which reviewed actions were selected: Random selection (1st , 3rd and 6th proposal).

PART A. INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, and withdrawals) that were *completed within the past three fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged. Please do not take time to answer questions if they do not apply to the program.

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

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

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

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

Is the review process efficient and effective? Comments: REU: A panel review seems to be the most efficient and effective way to comparatively evaluate the broad array of REU proposals received for review.	Yes
Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines? Comments: UMEB: Many reviews did not address criterion 2 adequately. C- RUI: Reviewers did not always address program priorities and criterion 2.	Yes
Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer's recommendation? Comments: UMEB: In most reviews, the discussion of impact was abbreviated and very generic. REU: There was general consensus that the reviews clearly delineated the strengths and weaknesses in the proposals under review.	Yes
Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments: UMEB: The discussion of program's broader impacts is too abbreviated.	Yes
Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: C-RUI: The review analyses, as well as other documentation, were missing in some folders.	Yes

Is the time to decision appropriate? Comments: REU: A number of issues related to this topic were raised in the COV discussion of the REU program. First, the time to decision has improved over the '00 to '02 period under review. In '00 and '01 numerous proposals (57% and 76%) required more than 6 months for decisions while in '02 all decisions were made in 6 months or less. The program officer should be commended for this improvement. Second, because many undergraduate students will have already made summer plans by mid-March, it is critical that award decisions be communicated to project directors as early as possible in the year. Otherwise, sites will not be able to recruit a diverse pool of applicants for the first summer Third, the importance of early notification of unfunded programs was also noted. Many faculty and programs must begin planning and budgeting for summer support earlier than a mid-March deadline. Thus, it is critically important for PIs to receive the earliest possible notifications of both awards and declinations.	Yes

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

UMEB: The use of a small number of institutions to review the proposals and the continued use of the same reviewers over the three year period raise concerns about the quality of the review process. There were few, if any, Hispanic (other than Puerto Rican) or Native American reviewers. There could be better training of the review panels to increase their understanding of the cultural diversity of the applicant institutions.

C-RUI: The review process for the years under review revealed gaps regarding coherent understandings by review panels about the C-RUI goals and program priorities. The move to a single, cohesive, inter-disciplinary panel review process should be an important improvement for the program. We recommend that more attention also be paid to selecting panels that better represent the diversity of undergraduate institutions.

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers.

Provide comments in the space below the question. Discuss issues or concerns in the space provided.

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Have the individual reviews (either mail or panel) addressed whether the proposal contributes to both merit review criteria? Comments: UMEB: The reviews often commented superficially on Criterion 2. C-RUI: Numerous reviews do not address criterion 2 in a substantive manner. REU: See below.	Yes
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria? Comments: Postdoctoral Programs: During the three year period in question, there has been an improvement in panels addressing the second merit review criterion. REU: See below.	Yes
Have the *review analyses* (Form 7s) addressed whether the proposal contributes to both merit review criteria? Comments: C-RUI: Some documentation lacking. REU: See below.	Yes

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

Postdoctoral Programs: NSF needs to continue to educate the scientific community regarding the broad impacts criterion. Adding examples of acceptable statements of broad impact to the program description may help the scientific community better understand this criterion.

UMEB: A central goal of UMEB is to increase the number of individuals from underrepresented groups pursuing careers in Environmental Biology fields. That goal itself constitutes the summary statement for criterion 2 found in most of the reviews and summary statements. The reviews do not expand on the initial supposed impact of the proposals under review. Impact needs more attention.

C-RUI: Attention to impact/criterion 2 is needed in the C-RUI review process. The C-RUI program would benefit from greater clarification of the program's goals and priorities for both the applicants and reviewers. The current program officer is addressing these issues.

REU: There was general consensus that the reviews, panel summaries and Form 7s have improved in this area over the '00-'02 window under consideration. Specifically, earlier reports were inconsistent in addressing criterion 1 objectives, while those from '02 clearly responded to both criteria 1 and 2 issues. The program officer should be commended for emphasizing the importance of reviewer response to these issues.

A.3 Questions concerning the selection of reviewers. Provide comments in the space below the question. Discuss areas of concern in the space provided.

SELECTION OF REVIEWERS	YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Did the program make use of an adequate number of reviewers for a balanced review? Comments:	Yes
Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: C-RUI: Some reviews did not address the training components of proposals. Reviewers with a better understanding of the integration of research in education at undergraduate institutions could provide necessary expertise in this regard.	Yes
Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: UMEB and C-RUI: The composition of the panels needs to be broadened to be more representative of the types of institutions targeted and to include more HBCU's, HSI's, and Tribal Colleges. REU: It was noted in a prior COV that there seemed to be a higher than desirable number of reviewers from the east coast. This issue seems to have been adequately addressed with review panels from the '00-'02 period representing a good diversity of geographic regions and institutional types.	Yes, except UMEB and c-RUI (see comments)
Did the program recognize and resolve conflicts of interest when appropriate? Comments: REU: No COI issues were observed in the jackets that were examined.	Yes

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

Composition of the panels for C-RUI and UMEB. See above comments.

A.4 Questions concerning the resulting portfolio of awards under review. Provide comments in the space below the question. Discuss areas of concern in the space provided.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
Overall quality of the research and/or education projects supported by the program. Comments: UMEB: The quality of the projects is adequate, but some of the projects do not appear to be meeting the program's goals. While the program is targeted toward underrepresented minority students, many awards do not feature large enough numbers of underrepresented students. The competition needs to be more open, and the eligibility criteria for institutions/PI need to be widened. REU: Because the training environment is likely to influence the directions REUs choose to pursue in their research careers, sites that are focused on areas of research traditionally funded by the NSF BIO directorate should be given highest priority for REU site funding.	Appropriate
Are awards appropriate in size and duration for the scope of the projects? Comments: UMEB: There appears to be a pattern of underutilization of student support funds due to problems in recruitment. REU: The program should be encouraged to continue to fund for five years some of the particularly well-established projects that are doing an excellent job of meeting program goals.	Appropriate
Does the program portfolio have an appropriate balance of: • High Risk Proposals? Comments: REU: The PO should be encouraged to provide a higher degree of oversight and provide or arrange for informal mentoring of the Project Directors of high-risk projects to help ensure the success of these potentially high-impact projects.	Appropriate

Does the program portfolio have an appropriate balance of: • Multidisciplinary Proposals? Comments:	Appropriate
Does the program portfolio have an appropriate balance of: • Innovative Proposals? Comments: REU: This issue was somewhat less clear. Although there was some evidence of programs involving interactions with community/tribal colleges or international settings, most programs followed a fairly standardized format. The COV suggests that program officers should continue to encourage innovative approaches to training via the inclusion of specific language in the RFP.	Appropriate
Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals? Comments: Not applicable to postdoctoral fellowship programs.	Appropriate
Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments: REU: While it is clear that REU site renewal requests have in the past had a very high probability of funding, overall increases in funding of the REU program have allowed significant numbers of new awards to be made each year under review. Data from the annual reports suggests that the success rate of renewal proposals has dropped considerably (to 31%, i.e., below the success rate of new proposals) in the most recent year. This trend points to the importance of increased communication of project goals and expectations to currently funded PDs.	Appropriate
Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments:	Appropriate

Does the program portfolio have an appropriate balance of: • Institutional types? Comments: Not applicable to postdoctoral fellowships which are awarded to individuals, not institutions. UMEB: Very few HBCUs, HSIs, and Tribal Colleges submit proposals for the program. Nearly none are accepted. Awarded programs from such institutions appear to have a better rate of success with program's goals. For example, Cal State LA was able to recruit 7 students (more than meeting recruitment goals), and 4 of the 7 students were underrepresented minorities. C-RUI: Very few HBCUs, HSIs, and Tribal Colleges submit proposals for the program	Appropriate, except for UMEB and c-RUI (see comments)
Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments:	Not applicable – all projects in this cluster are for education goals
Does the program portfolio have an appropriate balance: • Across disciplines and subdisciplines of the activity and of emerging opportunities? Comments:	Appropriate
Does the program portfolio have appropriate participation of underrepresented groups? Comments: UMEB: Despite the stated goal of the program to increase the number of underrepresented students in Environmental Biology fields, the number of underrepresented minority students in the program appears quite low. Internal documentation is contradictory. C-RUI: The data were not available to us.	Appropriate
Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. Comments:	Appropriate

Discuss any concerns identified that are relevant to the quality of the projects or the balance of the portfolio.

UMEB: The eligibility criteria of the PI/institution narrow the field of eligible applicants who could actually meet program goals. All efforts to increase the applicant pool for this program so to encourage and facilitate applications from institutions that can adequately meet the program's goal to increase the diversity of students entering Environmental Biology (or other) fields should be pursued. There is a need to develop better measurements of the effectiveness of the overall program and individual projects, and feed that back into the continuing proposal and review process (e.g. best practices, performance data).

C-RUI: The review process is being centralized to a single multi-disciplinary panel, which should enhance the quality of the review and balance of the portfolio.

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

Management of the program.
Comments:

UMEB and C-RUI: The management of the programs for the three years under review revealed some weaknesses, which are being addressed by the directorate. Weaknesses included documentation of data and adequate oversight of project goals.

REU: Many REU sites would likely benefit from additional monitoring. Although the ideal approach would be to site visit each site in its 2nd or 3rd year (i.e., prior to the submission of a renewal proposal), it is understood that available resources would not be sufficient to support this approach. Instead, it is suggested that the Program Officer conduct a telephone (or video) conference with each Project Director in the 2nd or the 3rd year. This conference should include an assessment of how well the project has met the goals of the funded proposal and seek to identify successes and areas needing additional attention by the PD. A summary of each conference should be included in the jacket and also made available to the review panel when considering renewal submissions.

To better assess the impact of the REU site program on students and to facilitate comparisons among projects, NSF should establish a mandatory web-based survey of all student participants at REU sites similar to that used for IGERT projects. This survey should include demographic information, career plans, student evaluations of the REU site and its activities. Surveys should be completed by participants during the final week of the REU period. Summary data from these surveys should be made available to the project directors and the review panel when considering renewal submissions. These data would also prove invaluable for future COVs.

Additional mechanisms are needed to encourage the wide dissemination of best practices. One mechanism would be a biennial meeting of REU site project directors. Summaries from this meeting should be disseminated to the larger community via appropriate mechanisms.

Responsiveness of the program to emerging research and education trends.
Comments:

UMEB: Based upon the annual reports and UMEB project reviews, there is evidence that the program is trying to respond to emerging research and education trends, including providing experiential learning opportunities for undergraduates and more robust peer support networks.

C-RUI was designed to be responsive to emerging education and research trends.

Program planning and prioritization process (internal and external) that guided the development of the portfolio under review.
Comments:

UMEB: The process should be broadened.

C-RUI: The centralization of the process is appropriate at this time.

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

UMEB and C-RUI: The directorate is responsive and active in addressing the management concerns.

REU: All sites should provide travel funds for REUs. Otherwise, those students who might best benefit from an REU may need to forgo the opportunity simply for financial reasons.

PART B. RESULTS : OUTPUTS AND OUTCOMES OF NSF INVESTMENTS

NSF investments produce results that appear over time. The answers to questions for 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 FY 2003 Performance 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.

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

Comments:

Postdoctoral Programs: As an NSF Postdoctoral Research Fellow in Biological Informatics, Dr. Matthew McHenry (DBI-0204066) will study at the University of Groningen in the Netherlands which has a unique mechano-physiology laboratory. In 2002, thirteen postdoctoral fellows were reported as having received research starter grants, indicating that each has an academic position where he/she will start their independent career.

UMEB: The UMEB program has the strong potential to contribute to NSF's goal of developing a diverse workforce, particularly in the fields of environmental biology. Excellent examples of such potential can be seen in the project awarded to Carlos Robles at CalState, LA (ID # 0102495) and the project awarded to Raymond Pierotti, University of Kansas (ID #: 0203404).

C-RUI: The C-RUI has the very strong potential to contribute to NSF's goal of developing a diverse and globally engaged workforce. An excellent example of such a proposal can be seen in the project awarded to Wade Hazel of DePauw University (ID #: 0223089).

REU: Overall, it is the impression of the COV that the NSF REU program remains a remarkable success and is deserving of the highest accolades. Undergraduate research experiences are an important determinant of graduate school admittance and success. The REU site program offers such experiences for 500 – 750 undergraduates of diverse backgrounds annually. Additionally, towards the goal of creating a globally engaged workforce a number of REU sites have incorporated international research experiences as part of their programs.

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

Comments:

Dr. Pamela Padilla (DBI-9972557) while a Minority Postdoctoral Research Fellow studied molecular mechanisms used by metazoans to respond to environmental changes. Her work was reported in PNAS and Science as well as resulting in a patent application.

B.3 OUTCOME GOAL for TOOLS: Providing "broadly accessible, state-of-the-art and shared research and education tools."

Comments: Not applicable for the training cluster.

PART C. OTHER TOPICS

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

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.

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

UMEB, C-RUI: Additional guidance for review panels and better dissemination of lessons learned and best practices may improve programs under review.

REU: It appears that the Community Colleges, which include Tribal Colleges, are competing for the same pot of funding available to large universities for the establishment of REU sites. This will likely place the CCs and TCs at a competitive disadvantage since these institutions will often not have equivalent infrastructure in place. NSF should consider implementing practices and/or new programs (e.g. pre-REU sites) to allow these institutions to successfully initiate REU or similar programs, since these institutions are often a first contact for underrepresented constituencies.

Members of the COV also have observed that a critical factor in improving the pipeline of future scientists resides in the research experience of high school science teachers. NSF should consider funding RET sites.

REU sites at minority-serving institutions should be encouraged to recruit a fraction of non-minority students as REU participants.

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

The COV commends the Foundation for its continued focus on developing and implementing programs to diversify the scientific workplace. The Foundation should continue to pay special attention to facilitating applications from minority serving institutions and to requiring majority research institutions in their applications to explicitly demonstrate strategies for the recruitment and advancement of minority students.

We recommend that the stipends for all postdoctoral programs be increased. The MPD and BIPD programs, in particular, may suffer from a loss of highly qualified applicants because of low stipends in comparison to those offered by other agencies, other fields or industry. The stipend should be $40,000-$45,000.

The members of the COV wish to encourage the NSF to continue to involve faculty from Tribal Colleges in the REU site proposal evaluation and COV program evaluation process. It is clear that participation in this process serves to both educate potential applicants to the REU site program and breaks down barriers to submission of proposals. Since Tribal Colleges could benefit enormously from participation in the various NSF programs, expanded involvement of their faculty in the NSF process should be sought.

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

To efficiently evaluate the various programs assigned to this COV, the panel broke into 3 subgroups of 3 people each focused on specific programs. Future COV panels would likely take a similar approach and it would be useful to provide separate small workrooms for this purpose. With several sub-groups in the same room it was occasionally difficult to focus on the task at hand. Each COV participant should have access to a laptop computer. A computer projector would facilitate interactive editing. Existing plans for an interactive editing web site for COVs as is used for NSF panels should be encouraged.

Part D. SPECIFIC PROGRAM QUESTIONS

D.1 Post doctoral programs

D.1.1 What fields of study in biology should be targeted, i.e. new areas?

The Interdisciplinary Informatics Postdoctoral Program should be extended for the next five years and remain under the BIO directorate. The program announcement should emphasize the interdisciplinary nature of the program and the potential for data mining, including not only genomics and proteomics, but also other "fields" in biology that have historically been data rich. These include museum collections, conservation biology, biodiversity and ecology. Because computer science and engineering graduate students may be appropriate applicants for these programs, the program officers should open discussions with the Engineering and Computer Science directorates.

The postdoctoral program in microbiology is filling a void. It is also potentially data-rich and will become more interdisciplinary in the future. This should be encouraged.

The Minority Postdoctoral Program also fills an important niche. Applicant numbers are small compared with the biomedical field. Increasing stipend levels may encourage more applicants.

As biology continues to become increasingly interdisciplinary, consideration should be given to offering postdoctoral programs with the following intent:

- Integrative approaches to answering global biological questions (Bio-Chem, -Ecology, -Geography, -Economics).
- To study biological questions at the interface of biology and social science (Bio-Environmental Science, -Ecology).
- Technology development and technology transfer.

D.1.2 Are the programs reflecting the integration occurring across biology?

MBPD and BIPD programs do reflect the integration occurring across biology. They could be strengthened by asking the applicant to specifically address how their proposal brings two or more fields together. In addition, NSF could offer new programs that are inherently interdisciplincary.

D.1.3 What possible goals could the program achieve that are not being addressed by postdoctoral opportunities within research programs and grants?

The NSF Postdoctoral Fellowship programs' primary goal is training fellows in research. This is the most appropriate goal. The fellow should be encouraged to:

1. produce a professional development plan
2. learn how to manage a budget
3. gain proposal-writing experience
4. use funds for foreign travel to international meeting or for lab exchanges.

We recommend that the fellow work closely with the mentor to develop a professional development plan. The COV would like to see the mentors held accountable. Although this may be difficult to enforce before the award is given, it may be possible to require a report on progress in both the research and the professional development plan at one year or mid-way in the grant. Since the award is given to the fellow and not the institution, the fellow should be strongly encouraged to manage the award. This is a skill they will need in the future. Another skill is proposal writing; the mentor should be encouraged to include the fellow in this process.

Some fellows may want to include teaching. Fellows may be encouraged to teach where appropriate but this should not be a primary goal of the program.

D.1.4 Topic selection: BIO awards individual fellowships in emerging areas where biology intersects with other scientific (and engineering) disciplines where trained people will be needed to fill leadership positions in academia and industry in the near future. The topical areas must be timely and important and have high impact. How well has BIO selected topics that fulfill its goal?

BIO has selected topics for the Postdoctoral Programs well.

D.1.5 Criteria used to select Fellows: The review consists of balancing a number of important factors. Panelists are asked to judge the applicant's ability, prior accomplishments, and potential based on the CV and references from the thesis advisor and one from another scientist who knows the applicant well. They are asked to evaluate the proposed research and training plan on its scientific merit, feasibility, significance in generating new biological knowledge, and impact on the career development of the applicant.

Other important factors include suitability of the sponsoring scientist(s) and host institutions. The program gives preference to applicants who propose foreign tenures and, in the case of the Minority Postdoctoral Fellowship program, who are graduate students at the time of application. Are these appropriate and complete evaluation and selection criteria?

Criteria used to select fellows are appropriate for the Postdoctoral Fellow award. Fellows should be encouraged to take advantage of opportunities to travel, visit international labs, and participate in any foreign collaboration their mentors may have established. However, preference should not be given to applicants that propose foreign tenure.

The Minority Postdoctoral Fellowship program correctly gives preference to applicants currently attending graduate school. We recommend for this program, because of the small applicant pool, that this be modified so that applicants may use this program for either first or second postdoctoral positions, but not more. More than two postdoctoral fellowships are not looked upon favorably by most institutions hiring new faculty.

D.1.6 BIO sees the postdoctoral period as an important career development stage. Is adequate emphasis being paid to the applicant's training goals in the fellowship applications?

See above recommendations to add a professional development plan.

D.2 Undergraduate programs

D.2.1 In light of changes occurring within the undergraduate curriculum across the country, do the NSF programs still address areas that need funding?

Given the cross-disciplinary nature of new curriculum development, the interdisciplinary focus of these programs is very appropriate and should be continued.

D.2.2 Are there groups of students whose entry into biological sciences (or science in general) presents special challenges and how can these challenges be addressed? Should there be a pre-REU at some institutions?

A REU for pre-service middle and high school math/science teachers would be a worthwhile addition to the REU or RET format.

Because students majoring in the computational and physical sciences offer great promise to biology, NSF should continue to make efforts to involve these students in REU programs.

A pre-REU program should be implemented because it has the potential to greatly broaden the participation in the REU site program.

D.2.3 Are there undergraduates that are not being served by these programs and how can they be addressed? (Can UMEB be expanded to cover more than just minority students at major research institutions for year-long programs?

UMEB program eligibility should be modified and the research fields expanded to widen the pool and diversity of applications and to impact greater numbers of minority students. Expanding the PI/institutional eligibility to facilitate and encourage applications from minority serving institutions would better meet program goals. Expanding the disciplinary fields would enable the program to address other fields, beyond environmental biology, where increasing the diversity of students is of particular need. Given that the Directorate has already changed eligibility requirements, we recommend that it find a way to inform the community of these changes, and of the commitment to broaden the inclusiveness of the program.

D.2.4 Should REU opportunities be available for students at their own institutions? Are there non-minority students that need programs? Etc.)

Yes, because where the data exists, there are strong correlations between undergraduate participation in research and those students' graduation rates and their retention in the field.

In addition to minority students there are many other groups that would benefit from access to REU programs. These include 1st generation college students, the disabled and others who have overcome hardships to enter college. For these students on-site REU opportunities might be the only realistic opportunity to participate in a structured research program.

D.2.5 How can NSF encourage more research activities (experiential learning) to be integrated into undergraduate training?

UMEB has great potential in this area, but more attention needs to be paid to the ways UMEB projects feature year-round research opportunities.

The C-RUI program is designed specifically to integrate undergraduate research training with their education while increasing faculty research capacity. We recommend that the name of C-RUI be changed to Cross-Disciplinary Research at Undergraduate Institutions (CD RUI) or Cross-Disciplinary Education and Research at Undergraduate Institutions (CDE RUI). This name change will underscore the value of the cross disciplinary research context provided by C-RUI projects, and the ways in which such projects enrich the undergraduate educational experiences. Continued attention should be paid to improving the effectiveness of the C-RUI program.

D.2.6 Are there sufficient incentives for under-served students to undertake research opportunities? How can these opportunities be made more attractive?

The expansion of UMEB to minority serving institutions will increase these opportunities. Specific university and national studies suggest that the cohorting of students in research participation and study has positive effects on their retention, performance, and graduation rates.

To both build research capacity at undergraduate institutions and to encourage the participation of undergraduate students who might otherwise not have the confidence to spend a summer at a large institution in another area of the country, NSF should consider establishing coupled REU/ROA sites that would recruit faculty/undergraduate teams from primarily undergraduate institutions.