

DOCUMENT RESUME

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Report to Rep. Olin E. Teague, Chairman, House Committee on Science and Technology; by Elmer E. Staats, Comptroller General.

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About 2,000 institutions compete for National Science Foundation (NSF) research funds which are awarded mainly through grants to colleges and universities. In fiscal year 1977, academic and other nonprofit institutions received about 10,200 grants totaling over \$570 million. In deciding whether to fund proposals, NSF officials get comments from experts (peer reviewers) in the fields of the proposals.

Findings/Conclusions: Accountability in the proposal evaluation process is still a problem in spite of actions taken by the NSF over the past 2 years to improve the process. Action review boards, made up of officials in each of the six directorates awarding grants, were established to ensure that proposal evaluations complied with policies and procedures. However, some grants reviewed by the boards lacked proper justification; some grants were excluded from review; reasons for selection of specific peer reviewers and the disposition of reviewer's comments were not adequately documented; there was no periodic reporting of boards' findings; and board members were not independent of the evaluation process. At GAO's suggestion, NSF established an Office of Audit and Oversight which samples proposal actions after they are finalized to evaluate documentation and compliance with procedures. However, preaward controls are also needed. Other weaknesses in the process involve lack of consistency among NSF's directorates in documenting the bases for selecting peer reviewers and how their comments are handled and officials responsible for approving decisions who are not expert in proposals' subject areas.

Recommendations: The NSF should require documentation in proposal files to show: the relationship between the expertise of peer reviewers selected to evaluate a proposal and the critical elements to be evaluated, how reviewers' adverse

comments or constructive criticisms are handled when deciding to fund a proposal, and the disposition of favorable peer reviewer evaluations when deciding not to fund a proposal. It should also develop internal controls to insure that researchers who request copies of peer reviewers' comments on their proposals receive all the reviews. (HTW)

REPORT BY THE

8074

Comptroller General

OF THE UNITED STATES

Accountability In The National Science Foundation's Review Process For Grant Awards Needs Strengthening

Obtaining the advice of experts in the subjects of proposals for research support is critical in the National Science Foundation's evaluation process for making grant awards.

However, accountability in the evaluation process continues to be a problem. All proposal files should show why the experts were selected and how their comments were handled, so that Foundation officials who review the staff's recommended decisions on proposals can be sure that equitable evaluations were made.

The Foundation needs to establish internal controls to make sure that all experts' review comments are provided to researchers who request them.

This study was requested by the House Committee on Science and Technology.





COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-133183

The Honorable Olin E. Teague
Chairman, Committee on Science
and Technology
House of Representatives

Dear Mr. Chairman:

In accordance with your September 15, 1976, request and subsequent discussions with our representatives, we reviewed the National Science Foundation's action review boards and a sample of grant applications to determine whether (1) the boards were effective in assuring that the grant award process complied with the Foundation's revised policies and procedures and (2) the revised procedures, particularly those regarding the operation of the peer review system, had improved accountability for the decisions made on grant applications. The Foundation's views on our findings and recommendations are included in the report.

As arranged with your representatives, our office will release the report today. We are sending copies of the report to the Director, National Science Foundation; the House and Senate Committees on Appropriations and their Subcommittees on HUD-Independent Agencies; the Senate Committee on Human Resources and its Subcommittee on Health and Scientific Research; your Subcommittee on Science, Research, and Technology; and other parties.

We are available to discuss our findings and to provide any further assistance you might need in studying the Foundation's grant award process.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Thomas B. Staats".

Comptroller General
of the United States

COMPTROLLER GENERAL'S REPORT
TO THE COMMITTEE
ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ACCOUNTABILITY IN
THE NATIONAL SCIENCE
FOUNDATION'S REVIEW
PROCESS FOR GRANT
AWARDS NEEDS
STRENGTHENING

D I G E S T

Accountability to insure fairness and equity in the National Science Foundation's process for evaluating research proposals continues to be a problem.

In deciding whether to fund proposals, Foundation officials get comments from experts (peer reviewers) in the fields of the proposals. The officials (program officers) initially responsible for reviewing proposals rely heavily on the experts' comments--the heart of the evaluation process--in considering their actions recommended to higher level officials.

About 2,000 institutions compete for National Science Foundation research funds, which are awarded mainly through grants to colleges and universities. Competition is keen, and funds are limited. In fiscal year 1977, less than half of the 24,000 proposals for research support were funded. Academic and other nonprofit institutions received about 10,200 grants totaling over \$570 million.

Over the past 2 years the Foundation has taken a number of actions to strengthen procedures to improve the effectiveness, openness, and accountability of the proposal evaluation process. The actions were taken largely in response to management deficiencies, such as inaccurate representation of peer reviewer comments, noted during congressional hearings and by GAO.

Officials responsible for reviewing the recommended actions on grant applications before the decisions are finalized do not always know (1) why certain peer reviewers were selected to evaluate the proposals and (2) how many of their comments were handled as neither of these is shown in the files. This information is critical in deciding if the recommended actions are justified. (See pp. 20-34.) Also, researchers requesting to see the comments on their proposals were not given all comments, as Foundation policy provides for. (See pp. 45 to 48.)

The Foundation should require documentation in the proposal files to show:

- The relationship between the expertise of peer reviewers selected to evaluate a proposal and the critical elements to be evaluated in each proposal.
- How reviewers' adverse comments or constructive criticisms are handled when deciding to fund a proposal.
- The disposition of favorable peer reviewer evaluations when deciding not to fund a proposal.

The Foundation also should develop internal controls to insure that researchers who request copies of peer reviewers' comments on their proposals receive all the reviews, as specified in the Foundation's policy on release of verbatim comments.

PROBLEM DESCRIPTION

By 1976 the Foundation had established action review boards made up of its officials in each of its six directorates awarding grants. This was a major change to make sure that the essential points of proposal evaluations, such as peer review, complied with policies and procedures. GAO's review of the boards showed:

- Grants were awarded that had been reviewed by the boards but lacked the justification required by the Foundation.
- Various types of grants that received a significant amount of funds were excluded from the boards' review.
- Reasons for selecting specific peer reviewers to evaluate proposals were not stated in most of the proposal files reviewed by the boards, and the disposition of many of the reviewers' comments was not documented.
- There was no periodic reporting of the boards' findings to the Foundation's top management.
- Board members were not independent of the proposal evaluation process.

At GAO's suggestion for a more systematic quality control system, the Foundation established an Office of Audit and Oversight which, among other things, is responsible for sampling proposal actions, after they are finalized, to evaluate the adequacy of documentation and compliance with procedures. (See pp. 5 to 19).

This could strengthen internal control. However, better pre-award controls are also needed to insure fairness and equity in the proposal evaluation process before decisions on whether to fund a research proposal are made.

There is no consistency among the Foundation's directorates in documenting (1) the bases for selecting peer reviewers or (2) how their comments are handled. One directorate's files show why reviewers were selected and two show the disposition of almost all adverse comments--the others do not.

Foundation officials responsible for approving program officers' recommended decisions on proposals frequently are not expert in the proposals' subject area.

For many proposals the officials rely on the program officers to insure an appropriate selection of peer reviewers and a proper handling of their comments. (See pp. 20 to 32.)

The potentially large number of proposals handled by the Foundation's program officers must be considered in determining the need for more accountability. GAO believes that the technique of one directorate to show the selection of peer reviewers can be easily used by the other directorates. The disposition of peer reviewers' comments in the files can also be shown with minimal extra efforts by program officers. The extra effort would better assure that each proposal received a fair and equitable evaluation. (See pp. 32 to 34.)

Various interpretations of the policy for releasing peer reviewers' comments resulted in researchers not always being sent all review comments. (See p. 45.)

AGENCY COMMENTS

The Foundation did not agree that GAO's recommendations for more accountability in proposal files would better assure fairness and equity in the proposal evaluation process. The Foundation relies on existing pre- and post-award controls and on judgments of its staff to assure fairness.

GAO's review showed that Foundation officials responsible for approving program officers' decisions on proposals frequently rely on the staff's judgments because the officials are often not expert in the proposals' subject area. The post-award controls cited by the Foundation for the most part are not fully developed. However, they should not be substituted for effective controls to insure fairness in the proposal evaluation process before a decision is made whether to fund a proposal. (See pp. 34 to 40.)

The Foundation also stated that comprehensive studies have shown the peer review system to be "eminently fair." GAO found that the studies referred to did not reach definite conclusions regarding the fairness of the peer review system. (See pp. 40 to 42.)

The Foundation agreed that its policy on releasing peer reviewer comments should be consistently followed. Officials were instructed to correct any staff misunderstandings. The Foundation also said that its Office of Audit and Oversight would make spot checks for compliance with the policy. However, there are over 300 program officers in the Foundation who respond to requests from researchers for peer review comments. Concurrent reviews of the officers' responses are usually not required, but this is a practice which GAO believes should be formally implemented as an internal control. (See p. 49.)

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CHAPTER 1

INTRODUCTION

On September 15, 1976, the Chairman, House Committee on Science and Technology, asked us to review a sample of grant applications submitted to the National Science Foundation to determine whether the grant award process complied with the Foundation's revised grant administration policies and procedures. The Foundation had issued a number of new or revised policies and procedures over the preceding 2 years to improve the effectiveness, openness, and accountability of the grant award process. The actions were taken largely in response to management deficiencies we noted during our 1975 review of the Foundation's handling of a grant application for a science education project called Individual Science Instructional System and during hearings by the Committee's Subcommittee on Science, Research, and Technology in July 1975.

Pursuant to the Chairman's request and subsequent agreements with his office, we focused our review on the Foundation's action review boards. The boards were established as a quality control mechanism to insure compliance with the Foundation's policies and procedures for evaluating proposals for research support. A board was established in each of the Foundation's six directorates that awards grants and at the Director's level to review the essential elements of proposed grant awards and to assure that peer reviews and other parts of the proposal evaluation process followed Foundation policy. The boards are made up of Foundation employees who generally have a scientific, legal, business, or policy background. The boards advise directorate heads; the Director's board advises the Foundation's Director. The board duties of the employees supplement their normal duties.

BACKGROUND

The National Science Foundation is an independent Federal agency established under the National Science Foundation Act of 1950, as amended, (42 U.S.C. 1861 et seq.) 1970. Its general mission is to strengthen U.S. science by supporting (1) basic research and science education programs and (2) applied research on selected national problems (42 U.S.C. 1862). The research it finances is conducted primarily by colleges and universities through grants. About 2,000 colleges, universities, and other institutions participate in Foundation programs.

The Foundation acted on almost 24,000 proposals for research support of which 44 percent were funded--in fiscal year 1977. Nearly 10,200 grants totaling over \$570 million were awarded to academic and other nonprofit institutions. Based on the Foundation's current plan for fiscal year 1978, about \$641 million would be awarded.

The Foundation has six organizational units, called directorates, which operate the proposal evaluation process and award research grants. Each directorate is headed by an assistant director and is subdivided into divisions, sections, and programs representing specific science areas. The key individual in each program is the program officer--he/she manages the program's proposal evaluation process. Program officers are the focal point between the Foundation and the science community and are responsible for recommending whether a proposal should be funded.

PROPOSAL EVALUATION PROCESS

When a proposal is received by the Foundation, it is assigned to a program officer familiar with the proposal's scientific field. The program officer is responsible for evaluating the proposal and recommending to higher level management whether to fund the proposal. The program officer can draw on several sources, including peer review, staff review, consultation with other Federal agencies, and site visits, to help form a basis for the recommended action.

The peer review mechanism is the heart of the proposal evaluation process. It is used to consult scientists and educators throughout the country (generally outside the Foundation) who specialize in the discipline involved in a proposal. These experts (peer reviewers), who act as advisors to the Foundation, are selected by the program officers. Foundation policy requires that, with certain exceptions, all proposals receive peer review. After peer reviews are received, the program officers analyze them and recommend that grants be awarded, either in whole or in part, or that the proposal be declined.

If the program officer recommends an award, the recommendation is sent to higher level management for further review and approval. In general, this review and approval involves the section head, if any; the division director or office head; and the assistant director or the

deputy of the directorate. The action review boards review the proposal before the assistant directors give final programmatic approval to award recommendations. After this approval, the proposal file is sent to the Division of Grants and Contracts, where it is examined for conformance with Foundation policy on fiscal and administrative details. After the examination, the Division of Grants and Contracts prepares the award document. Recommended awards of at least \$500,000 in a single year or awards that will result in an actual or eventual total commitment of at least \$2 million are routed from the Division of Grants and Contracts, via the Director's action review board, to the Director and to the National Science Board for approval.

Recommended awards must be approved by a directorate's assistant director or person acting in that capacity. If the program officer recommends not funding the proposal, Foundation instructions allow the directorates flexibility in determining who can approve program officers' decisions. Foundation instructions provide that assistant directors, division directors, office heads, their deputies, and persons acting in these capacities are authorized to approve the declination.

OTHER FOUNDATION ACTIONS

The Foundation considered the establishment of action review boards as a major step towards assuring that the problems identified in the proposal evaluation process, which were mainly in the peer review system, would not recur. In addition, the Foundation developed or strengthened its policies and procedures regarding several crucial elements in the process. The Foundation issued guidelines to program officers on how to select peer reviewers and on the instructions to be provided to peer reviewers. Instructions were also issued on how peer reviewers' comments were to be handled by program officers. New policies were established on the release of peer review information to proposal applicants, and a manual containing the Foundation's guidelines was prepared for program officers' use in evaluating proposals. Also, program officers are offered a 1-week training course which considers Foundation policies and procedures.

RELATED REPORTS

GAO has issued a number of reports (app. I) on Foundation programs and projects in the past 3 years which showed that improvements were needed in the operation of the peer review system and/or the proposal evaluation process. The establishment of action review boards, and many other changes in the process, resulted in part from these reports.

CHAPTER 2

ACTION REVIEW BOARDS: A STEP TOWARD

QUALITY CONTROL

Our review results indicated that the action review boards might not be the best way to achieve quality control over the proposal evaluation process. In July 1977 we advised the Foundation's Director that

- the boards were not reviewing all proposed awards or most declinations,
- board members were not independent of the proposal evaluation process,
- there was no uniform system for documenting board reviews of proposal files or reporting board actions to the Foundation's top management,
- since there was insufficient documentation in the proposal files, we could not determine how the boards could determine if Foundation policies and procedures for selecting peer reviewers and evaluating their comments were followed, and
- some of the grant award recommendations reviewed by the boards did not contain the information required by Foundation instructions to justify the award.

In October 1977, at our suggestion, the Foundation's Director established a separate office, reporting directly to him, to operate the quality control system over the proposal evaluation process. This chapter discusses our findings and the Director's actions.

ACTION REVIEW BOARD ORGANIZATION AND PROCEDURES

In a March 1976 letter, the Foundation's Director advised the Chairman, House Committee on Science and Technology, that the boards would consider the following main points in reviewing each proposed grant award.

- Is the purpose and thrust of the individual project consistent with the objectives of the program?
- Were Foundation award and contract policies and procedures followed?
- Were the reviewers appropriate?
- Was full and adequate consideration given to reviewers' comments?
- Are the investigators qualified and are the institutional resources adequate to carry out the project?
- Is the title of the proposed project meaningful to the extent possible?

The Foundation's Director allowed the research directorates to set up boards that would best meet their operating needs. Each directorate issued operating instructions for its board that generally covered the main points outlined in the Director's letter. Each board was to serve in an advisory capacity to the assistant director of the research directorate. However, the organization and operating practices among the boards varied, as follows.

Board membership

Each board consisted of Foundation employees who generally had either technical (scientist), legal (attorney), business (grant administrator), or policy expertise. The technical members were high-level staff chosen from within the research directorate, such as deputy assistant directors, division directors, or program officers. Assignment to a board was an additional responsibility beyond the employee's normal responsibilities. Three directorates' instructions provided for rather frequently rotating the membership to a board among directorate staff, while in other directorates board membership was more long-term. The number of members for each board ranged from 7 to 11.

Boards' operating practices

The directorates' implementation of the action review board concept varied. Directorates had (1) a single board, (2) a board executive committee and a board, or (3) two separate boards, each of which reviewed specific actions.

Each board had an executive secretary whose duties generally were to track board members' review of the files, set up board meetings to discuss members' comments and make notes of agreements reached during meetings, and follow up on board actions resulting from the meetings.

Board members were required to individually review actions on proposals. Some boards' members were required to meet periodically, usually once a week, to discuss points raised on the files. Two boards met only when questions were raised by a board member. (It should be noted that these points and questions did not always become a written, permanent part of the proposal files.) After board members reviewed the files and after meetings were held, the files on which questions were not resolved were sent back to the program officer for clarification; files on which questions were resolved were forwarded to higher level directorate officials for their review.

Boards did not review
all proposal actions

In March 1976 the Foundation's Director advised the Chairman, House Committee on Science and Technology, that the boards would review all proposed awards. Various directorates, however, exempted their boards from reviewing certain types of proposed award and declination actions. Examples of exempted types of actions follow:

- Committed renewals to continuing grants (a formal commitment to provide a subsequent specified amount of funds for a certain period, provided funds are available and the results warrant further support).
- Grant supplements (small amounts of additional funding and up to 6 months of additional time beyond the established expiration date of the grant).
- No-cost extensions (additional time beyond the established expiration date of a grant to assure adequate completion of the original scope of work within the funds already made available).
- Block grants (large support program operating on an annual cycle for which a closing date is established for receipt of proposals that are evaluated in a competitive process by panelists).

- International travel grants (awarded to a U.S. scientist to attend an international meeting, to visit a foreign university or laboratory, or to reach agreement with scientists of a foreign country).
- Declinations (a proposal processed through the Foundation's proposal evaluation process but not funded).

The rationale for these exemptions was:

- Committed renewals are contingent only on satisfactory progress being achieved during the earlier period. However, the work proposed for the entire project was considered when the original grant was made.
- Supplements typically are justified on the basis of documentation obtained when considering the original award.
- No-cost extensions do not involve a commitment of new funds.
- Individual awards for block grant programs are not reviewed because block awards are made using a competitive rank order merit system which selects proposals having the highest merit in competition with other proposals reviewed. Announcements and proposal review procedures for block grant programs are examined by the board.
- International travel grants are devoid of policy issues.
- The appeal procedure for declinations provides a mechanism for correcting an action that is found to be erroneous.

Regarding the significance of the actions exempted from various boards' review, we noted the following.

- Only one board was not considering any declinations. That directorate had 3,076 declinations in calendar year 1976. Three directorates' boards required that a 10-percent sample of declinations be reviewed, and the remaining two boards reviewed all declinations.

--The three directorates which funded nearly all of the Foundation's 1,378 fiscal year 1976 committed renewals to continuing grants, totaling about \$79 million, exempted these actions from board consideration.

--Only one directorate has totally exempted supplements from board consideration. In fiscal year 1976 it funded 91 supplements totaling \$2.5 million.

--Only one directorate has block grant programs. In fiscal year 1976 block grants totaled about 93 percent of the total number of proposals funded by the directorate and 77 percent of its total program obligations.

Documentation and reporting of board members' comments and board actions

We noted that the action review board system did not provide a uniform method for recording (1) board members' individual and group comments and (2) board actions to resolve the comments regarding each file reviewed. (An internal Foundation study contained similar findings.) All of the boards documented board members' comments and/or the actions recommended by the board. Two boards used review sheets for members to record their comments. Four of the boards had notes of agreements reached at their meetings. Two boards had both.

A record of the boards' review and the actions taken are retained in the proposal files in only two of the directorates. None of the boards' comments were compiled nor were results reported to the Foundation's top management.

Director's action review board

This board reviews the proposed awards that require approval by the National Science Board. The board reviews the awards for the Foundation's Director prior to submission to the National Science Board.

The proposed awards are reviewed by the Director's Board for merit, adequacy of review, and compliance with policies and procedures. Board membership includes four permanent members: the Foundation's deputy director (the board's chairman), general counsel, assistant director for administration, and a staff member from the Director's office

who serves as executive secretary. The board also includes members who are selected on an ad hoc basis by the Foundation's deputy director to insure a broad spectrum of viewpoints on each proposed award. The board reviews a package of documents from the proposed award file that is specifically prepared for the National Science Board. According to Foundation instructions, the package includes documents pertinent to the proposal evaluation process, such as the peer review comments on the proposal.

No checklist of specific points to be considered was established for the board. We attended a board meeting and observed that the questions raised by the board members appeared to be in the context of anticipated questions the National Science Board might raise when it reviews the proposed award. A Foundation official said the Director and Deputy Director also use this Board as a mechanism for raising a broader range of management issues such as distribution of program funds and program justification.

DOCUMENTATION IN FILES INADEQUATE
TO PROVIDE A THOROUGH CHECK ON THE
GRANT AWARD PROCESS

We reviewed 56 grant award and 18 declination files to determine whether the files were reviewed by a board and whether sufficient documentation was in the file to support the decision. (See p. 50 for selection criteria.) In reviewing the files, we considered

- selection of peer reviewers,
- instructions provided to peer reviewers,
- resolution of peer reviewer comments, and
- justification for the proposed award, which included qualifications of the researcher and consistency of the proposed research with the Foundation's program objective.

Of our sample of proposal actions, 47 awards and 6 declinations were reviewed by boards. The 9 grant awards not reviewed were committed renewals to continuing grants which were exempted from board review. Of the 12 declinations not reviewed by the boards, 9 were from directorates using sampling procedures, 2 were from a directorate whose

board was not reviewing any declinations, and I was from a directorate whose procedures exempted certain types of declinations.

Selection of peer reviewers

On February 13, 1976, the Foundation issued "Guidelines for Program Officers on Selection of Reviewers." This Foundation-wide instruction provides uniform detailed criteria to guide program officers in selecting peer reviewers to review research proposals. According to the guidelines, program officers should consider the following criteria when selecting ad hoc peer reviewers:

- Choose some reviewers who can evaluate the researcher's ability and the facilities available for conducting the research project.
- Choose some reviewers who have a broad view of the subject of the proposal and of fields which the Foundation's program officer believes might be directly influenced by the successful completion of the proposed project.
- Choose some reviewers who can comment on the utility of the proposed work.
- Choose some reviewers who can competently represent each of the principal institutional, educational, regional, or other elements of the relevant communities which might be affected by the project under consideration.

The guidelines state that not all the above criteria apply equally to every proposal or every program and that their relative importance will influence the selection of reviewers.

Included in the guidelines are references to the need for balance among differing points of view, with the understanding that program officers should be conscious of the scientific and personal biases of potential reviewers and any indications of bias in the reviews received. Also, the guidelines state that, to the extent possible, the set of reviewers for any single proposal should reflect a balance among various factors, such as geography, type of institution, and minority groups, and that the program officer must not involve reviewers in situations which might constitute a conflict of interest.

The Foundation also uses peer review panels to review proposals for research support in certain science disciplines. Peer review panels perform the same function as ad hoc peer reviewers, but do so at regularly convened meetings instead of individually. The guidelines noted above state that the criteria for the selection of ad hoc reviewers also apply to the choice of panel member reviewers, but that it is seldom possible to meet all these criteria with respect to all proposals when using a panel. The guidelines also say that it is important, however, that panels be structured to provide representation of different points of view on the matters under their purview.

Of the 53 proposal actions in our sample that were reviewed by the boards, 49 received peer review (43 awards and the 6 declinations). The Foundation's instruction on selecting peer reviewers does not require program officers to document why specific reviewers were chosen. However, the Science Education directorate does require its program officers to document peer reviewer selection. (See p. 22.) Only 8 of the 49 files contained any documentation relating the expertise or skills of the reviewers to the proposal or otherwise indicating why reviewers were chosen. These 8 files were from the Science Education directorate.

We reviewed the board members' comments for 22 of the award files to determine if members raised questions on the selection of peer reviewers. In 1 of the 22 award files a board member raised a possible peer reviewer/researcher conflict-of-interest situation. The board review sheet shows that the board member's comment was apparently resolved by the program officer.

Instructions provided to peer reviewers

The Foundation's "Guidelines on Instructions to Reviewers," dated February 13, 1976, requires that program officers send, along with the proposal, instructions to peer reviewers containing criteria for judging the proposal and some notion of the relative importance of the respective criteria. Foundation officials advised us that board members were not expected to question the proposal review instructions sent to peer reviewers.

Our review of 22 award files in our sample that were reviewed by action review board members showed that none contained copies of the instructions provided to peer reviewers. Also, the board members' comment sheets did not contain any questions on the instructions provided to peer reviewers.

Documenting the disposition of peer reviewer comments

The Foundation's instruction on handling peer reviewers' comments, as contained in an August 27, 1976, memorandum, required program officers to prepare a summary of pertinent factors leading to the recommended action. For award recommendations the memorandum states:

"This summary should specifically address reviewer ratings and comments in apparent conflict with the program recommendation: in particular, all negative reviews, including Fair and Poor ratings, should be discussed. The Program Officer should also indicate, when appropriate, whether the principal investigator has satisfactorily responded to major reviewer criticisms."

For declinations the memorandum states:

"A brief summary of the reviews and a justification are required for declinations where the basis for the recommendation is not obvious from the ratings alone."

Award recommendation summaries

For the 43 award recommendations in our sample that received peer review and were reviewed by action review boards, we found that the summaries prepared in two directorates (9 awards) provided adequate documentation of the disposition of all negative peer reviewer comments. Program officers' summaries in the other four directorates (34 awards) did not show the disposition of a number of negative comments for 17 of the files. One of the 34 proposal files did not contain a summary. An example of a summary that did not show the disposition of several negative peer reviewer comments follows.

This proposal was evaluated by five ad hoc reviewers. Although the reviewers gave the proposal favorable ratings, four of the five reviewers provided some negative comments. The summary prepared by the program officer did not mention the disposition of these negative comments.

Reviewer 1

"* * * Although there is, as stated, a considerable overlap with our own research, I have learned no 'secrets' from the proposal.* * *

* * * * *

"* * * They overlap in part strongly with investigations carried out in the reviewers group.* * *

* * * * *

"The reviewer opinion on***experiments using***is rather sceptical. [sic] I see no clear advantage at present * * * if the * * * density is not substantially higher * * *. Even then, the technical involvement [sic] is comparatively gigantic and expensive and the outcome dubious.* * *"

* * * * *

Reviewer 2

"* * * It is my feeling that there are too many things being pursued by too few people and as a result, other groups are making the real advances in the areas that this group is working in.

* * * * *

"I find it difficult to be enthusiastic about the * * * proposals, especially in view of the successes of other groups working on the same projects.* * *

* * * * *

"* * * Although this is a difficult * * * to study, there have been several (perhaps 6) groups publishing good research results over the past few years, and this contrast makes the proposal look weak. * * *

"* * * It seems to me that now is too late to present proposals which are extremely general and vague, and do not show any evidence of detailed analysis or particular innovative concepts. I don't feel that this part of the proposal can be supported on the information in the application.

"* * * I think it is very short sighted not to consider the desirability of either * * * in these experiments."

Reviewer 3

* * * * *

"My main comment on the * * * part is that I am flattered at his reference to the 2 year old***paper, but feel that he had not yet put in much time trying to go beyond those ideas.* * *

* * * * *

"Another point: * * * suggests that * * * light may make a better * * * source than * * *. I do not think that this is always true. * * *"

* * * * *

Reviewer 4

* * * * *

"The research proposed here does not contain new ideas: Some of it is really quite old in concept * * *."

* * * * *

The action review board record contained no questions on these comments.

We also examined action review board records for 12 of the remaining 16 award files that contained summaries which did not show the disposition of all peer reviewers' negative comments. The boards' records contained no questions on the comments for 11 of the files. On the remaining file, questions were raised for some of the undocumented comments.

Declination summaries

Of the 18 declination files in our sample, 17 received peer review but only 6 were reviewed by action review boards. The program officer did not show the disposition of many of the favorable reviews in one of the six. The board's record contained no comments about the peer reviewers' favorable reviews. The proposal received one excellent, one very good, three good, one fair, and one poor. 1/

Grant award recommendation

The Foundation requires that program officers provide a written justification showing why they believe a proposal for research support should be funded. At the time of our fieldwork the Foundation required that the justification contain statements concerning:

- Project's relation to Foundation program objectives.
- Significance/scientific merit of the project objectives and adequacy of the proposed techniques for achieving the objectives.
- Researcher's qualifications/competence.
- Statement of recommendation.

Seventeen of the 47 award files reviewed by action review boards did not contain at least one of the four justification statements. We examined action review board records for 12 of the 17 files. For these 12 files, the grant award recommendations in 7 did not contain a statement on the proposal's relationship to Foundation program objectives, 1 did not show the significance or scientific merit of the research objectives in the proposal, 7 did not contain any information on the researcher's qualifications or competence, and 2 did not contain a statement of recommendation. The award recommendation in 4 of the 12 files did not contain statements on two or more of the requirements. The boards' review records of the 12 files contained no questions regarding the incompleting award recommendations.

1/Peer reviewers usually give the proposal an overall ranking of either excellent, very good, good, fair, or poor.

GAO SUGGESTIONS FOR A QUALITY CONTROL SYSTEM

On July 20, 1977, we briefed the Foundation's Director on our review results, as previously stated. We commented that documentation in the proposal files was insufficient for us to determine whether (1) Foundation instructions had been complied with in selecting peer reviewers or (2) adequate consideration had been given to the peer review process in all cases in four of the research directorates. We also questioned how the action review board members could review these points, since without documentation in the file they would seemingly have to contact directorate officials responsible for reviewing the proposals. This step would be very impractical, given the thousands of proposals being considered. The Director told us that in his opinion an expert on the subject of the proposal would know why certain reviewers were selected and the importance of their comments, therefore eliminating the need for additional documentation of these decisions in the files. The Director was concerned, however, that the Foundation's policy on documenting the disposition of peer reviewer comments was not being interpreted uniformly by the directorates.

We advised the Director that a number of the award files in our sample that were reviewed by the action review boards did not contain all the information required by the Foundation to justify the award.

We also advised the Director that the memberships and operations of the action review boards presented potential problems that might limit their quality control effectiveness. These potential problems are:

- Action review board members are not independent of the proposal evaluation process.
- Various types of proposal actions are excluded from board review.
- Management problems, such as different interpretation of Foundation policy, are not likely to surface, since boards operate as separate entities and no report of their findings or operations is made to top Foundation management.

--Interviews with 32 board members showed about one-third believed that because many board functions were administrative (procedural compliance checks) they could be performed by persons at lower grade levels. Concern was also expressed that board membership added to an already burdensome workload.

We suggested to the Director that establishing a post-award/declination quality control system operated by persons independent of the proposal evaluation process might be a more effective method of identifying noncompliance with Foundation policies and procedures. Such a system would also offer greater opportunity to systematically review all types of Foundation proposal actions, through the use of statistical sampling, and to identify potential management problems by noting various directorates' practices in implementing Foundation policy. Findings and recommendations resulting from the quality control checks should also be periodically reported to the Foundation's top management.

Foundation Director's actions

Effective October 15, 1977, the Director established an Office of Audit and Oversight reporting directly to him. The responsibilities of the office include (1) sampling proposal actions (awards and declinations) after the decisions are made and post-award administration to evaluate documentation and adherence to Foundation grant award and administration procedures, (2) assessment of overall proposal evaluation process performance and recommendations for improved and simplified procedures, and (3) investigation of charges of improper actions by Foundation staff and monitoring of the appeals procedure for declinations. Because of the establishment of this new office, all directorates have been asked to reexamine their board procedures and recommend changes from current practices that are appropriate for their directorates. In October 1977 the Director also issued a revised instruction for documenting the disposition of peer reviewers' ratings and comments.

Establishing an Office of Audit and Oversight could be a positive step in strengthening internal control over the proposal evaluation process. However, the Director's revised instruction for documenting the disposition of peer reviewers' ratings and comments does not require the level of documentation in the proposal files we believe appropriate to insure fairness and equity in the decisions to

award or decline proposals. Further, inadequate documentation in the proposal files could greatly reduce the efficiency of the Office of Audit and Oversight, as considerable interviewing of Foundation officials and even researchers might be necessary to thoroughly review decisions on proposals. The following chapter discusses the need for more accountability in the proposal files.

CHAPTER 3

PROPOSAL FILES LACK RATIONALE FOR PEER REVIEWER SELECTION AND DISPOSITION OF COMMENTS

The rationale for the selection of peer reviewers and the disposition of their comments are critical elements in assuring fairness and equity in the Foundation's proposal evaluation process. However, there is no consistency among the Foundation's directorates in documenting in the proposal files the bases for the selection of peer reviewers or the disposition of their comments. One directorate's proposal files in our sample showed why peer reviewers were selected; the others did not. Two directorates' files showed the disposition of almost all peer reviewers' adverse comments; the other directorates did not. Foundation reviewing officials who determine whether program officers have followed Foundation policies and procedures do not always know why peer reviewers are selected or how reviewers' comments were considered by the program officers. Documentation is needed in all proposal files to assure accountability in the peer review process and to facilitate review by higher level Foundation officials as well as by its Office of Audit and Oversight.

KNOWLEDGE OF REASONS FOR PEER REVIEWER SELECTION

Foundation officials at various levels in the proposal evaluation process advised us that within their specific areas of expertise, such as solid state physics or genetic biology, they might know the reviewers and know why they were selected by program officers. However, the officials commented that many proposals are not within their areas of expertise. They therefore place great reliance on the program officer to comply with Foundation guidelines on peer reviewer selection.

Foundation officials' knowledge of reasons peer reviewers are selected

The Foundation's guidelines, although general (see p. 11), include criteria for choosing some reviewers who can evaluate the researcher's ability and the relevance and importance of the proposed research and who also represent a balance among various factors, such as geography and type of institution.

However, the specific reasons program officers choose peer reviewers vary. An example of the reasons a program officer picks a group of reviewers to evaluate a particular proposal and the knowledge of those reasons by Foundation officials who review program officers' decisions follows.

The program officer selected six peer reviewers--five of whom responded--to evaluate a proposal on resonance and radiation physics research. We interviewed the program officer to obtain his rationale for selecting the reviewers. He said:

--One was chosen because for 15 years the reviewer had used the specific research technique the researcher was proposing to use and was an expert on the use of the technique. (Reviewer 1)

--One was selected because he was a solid state physicist, but this reviewer did not respond. (Reviewer 2)

--One was selected because he was a chemist and knew about the research technique to be used by the researcher. (Reviewer 3)

---Three reviewers were chosen who were generalists in physics and who also were knowledgeable in the research techniques to be used by the researcher. (Reviewers 4, 5, and 6)

The program officer's supervisor, who was the program director and a scientist in the same discipline as the program officer, was unable to tell us why three of the peer reviewers were selected (Reviewers 1, 4, 5). He was familiar with the fields of expertise of the other three reviewers (one of whom did not respond--Reviewer 2) and assumed this was why they were selected.

We also spoke with the program director's supervisor, who was the section head and a scientist in the same discipline as the program officer and director. He did not know why three of the six peer reviewers were chosen. He was familiar with the three peer reviewers known by the program director and was especially familiar with the work and expertise of two of them.

As another example in a different directorate, five ad hoc reviewers--two of whom responded--were selected to review a proposal. The program officer who selected these

reviewers was no longer with the Foundation. The award had been made about 9 months prior to our review. The official responsible for reviewing program officers' recommendations on proposals for this program was a division director who had joined the Foundation after the award was made. However, the division director advised us that he was responsible for eight programs and that he could not possibly know why a program officer selects peer reviewers unless the proposal to be reviewed fell into his area of expertise. The proposal we were using as our example was not in his area.

The above examples illustrate that officials responsible for reviewing program officers' recommended actions on proposals might not always know the specific reasons peer reviewers were selected. This situation exists even if the subject area of the proposal is within the officials' areas of expertise. Although directorate reviewing officials could question the program officer about the selection, the high volume of proposals would seem to preclude such action on a frequent basis. The reviewing officials, instead, tend to rely on the program officers' expertise to assure that a balanced and thorough peer review is obtained.

Reasons for selecting
peer reviewers should
be documented in the files

The selection of peer reviewers is basic to the proposal evaluation process. The reasons for the program officer's selection of peer reviewers should relate to the critical elements of the proposal and be documented in the file to facilitate higher level Foundation review. The selection of peer reviewers is an extremely important element of the proposal evaluation process and should be watched closely. The credibility and integrity of the process of selecting peer reviewers is directly related to the fairness and equity of the proposal evaluation process. One Foundation directorate's procedures currently require that the reasons peer reviewers are selected be shown in the proposal files.

Science Education directorate program officers are required, for each proposal for research support that is peer reviewed, to document in the proposal files, for each peer reviewer selected, the reviewer's (1) academic institution, (2) position and organization unit within the institution, (3) discipline, and (4) skills or other expertise. The directorate's program officers use a preprinted form called a proposal review plan to show the required information.

We examined the proposal review plans for several Science Education research proposals. The plans contained the above information, such as the reviewers' skills and disciplines, which provided some indication of why the reviewers were selected. The plans, however, generally did not show the critical elements in the proposal and/or the relationship between these elements and the reviewers.

The Foundation already requires that other directorates' program officers use a similar form to show the peer reviewers selected for each proposal but not why the peer reviewers were selected--that is, because of certain skills--as required in the Science Education directorate.

DOCUMENTING THE DISPOSITION OF PEER REVIEWER COMMENTS

The requirements for documenting the disposition of peer reviewers' comments in the proposal files vary among the Foundation's directorates. Two directorates require that for award recommendations program officers document the disposition of all peer reviewers' adverse comments and what was done, if anything, to modify the proposal or resolve the comments. The other directorates largely leave the determination of whether comments should be documented in the proposal file up to the program officers. Reviewing officials in these directorates told us that the disposition of many peer reviewers' comments is not documented because the comments are not significant and are considered constructive criticisms. In addition, these officials said that since many proposals fall outside their areas of expertise they rely largely on the program officers' decisions.

Foundation policy on documenting disposition of peer reviewer comments

In October 1977, the Foundation issued a revised instruction to program officials for preparing the summary of pertinent factors leading to the recommended action on proposals. The new instruction states:

"* * * For awards, summarize pertinent factors on which the Program Officer's recommendation is based in the 'Mail and Panel Review Recommendation' section. This section should specifically discuss reviewer ratings and significant comments which are in apparent conflict with the program

recommendation. It should indicate, when appropriate, whether, the principal investigator has satisfactorily responded to major reviewer criticisms if asked to do so. If the proposal has undergone a panel or staff review only this should be noted in this section and panel review summaries should be included in the folder; * * *

Foundation officials advised us that the new instruction contained less stringent guidelines on summaries of peer reviewer comments for award recommendations. The previous instruction for award recommendations required that all peer reviewer comments in apparent conflict with the recommended action be summarized, whereas the new instruction requires that only significant comments need be summarized. Foundation officials said the procedure in the new instruction more closely represents actual practice by many program officers. They said many program officers were not summarizing all comments and that Foundation instructions should (and now do) reflect this fact. The new instruction allows the program officer to interpret the meaning of "significant comments" and act accordingly.

The new instruction was implemented largely as a result of our briefing before the Foundation's Director in July 1977, when we pointed out that various interpretations of the Foundation's requirement for summarizing peer reviewer comments were being made. At that time, two directorates' program officers were documenting the disposition of all adverse reviewer comments, while one was documenting many but three were documenting only a few. The lack of Foundation-wide uniformity in summarizing the disposition of adverse peer reviewer comments concerned the Director, who said that a new instruction would be issued clarifying the matter.

Disposition of peer reviewer comments remains unchanged

Foundation officials said the revised instruction for documenting the disposition of peer reviewer comments did not change past practices. The two directorates that were documenting the disposition of all adverse comments are continuing to require that this be done. Even if a reviewer's comment is judged irrelevant or invalid, the program officer has to say so and justify this position.

The other directorates that were not documenting the disposition of many comments are continuing to rely on the program officer to decide whether comments are "significant" and take the appropriate action on each comment. As a result, the new instruction does not change the operating practices the Foundation's Director was advised of in July 1977. The lack of uniformity in the Foundation's procedures for documenting the disposition and resolution of peer reviewer comments still exists.

Foundation officials in two directorates that do not require program officers to document the disposition of all adverse peer reviewer comments advised us that some of the comments are not significant. The two directorates made 62 percent of all awards in fiscal year 1976. The program officers or peer review panels in these directorates decide which comments are worth a written response. The rest are considered constructive criticism and do not merit a written response. Examples of comments that are considered constructive criticisms include comments on insufficient time or funds available to do the proposed research or duplication of research efforts by peer reviewers.

In one of these directorates, extensive use is also made of peer reviewer panels which either supplement or take the place of the ad hoc peer reviews. These panels meet periodically to review proposals in specific science areas such as genetic biology. If ad hoc reviews have been obtained, the panel review usually occurs afterwards. Directorate officials advised us that some program officers rely on the panels to evaluate and respond to ad hoc peer reviewers' comments. As a result, adverse comments made by ad hoc reviewers might not be resolved in the program officers' award recommendation summaries. According to directorate officials, the panel's recommendation to award a grant or decline a proposal is sufficient justification.

Examples of disposition of peer reviewers' comments not being documented

One of the proposals in our sample which was funded was reviewed by five peer reviewers (discussed previously on p. 14). Although all reviewers gave the proposal favorable overall ratings, four of the reviewers also questioned or criticized the proposed research. Most of the reviewers' negative comments pertained to two areas--uninnovative or duplicative research (four reviewers) and the research technique to be used by the investigator (three reviewers). None of the negative comments was addressed by the program

officer on the proposal summary. The program officer advised us that the decision to fund the proposal was justified despite the comments.

We asked the program officer's immediate supervisor, a program director who had reviewed and signed off on the award recommendation, to explain how the negative comments were resolved. The program director advised us that he dismissed the comments on duplication or lack of innovation in the proposed research because they are not negative comments--they are constructive criticisms. The comments on reviewers' concerns on the research technique did not need to be discussed since the program officer was knowledgeable regarding this technique and he (the program director) was not. The program director advised us that as a result he did nothing regarding these comments.

The section chief who reviewed this file advised us that three of the reviewers' comments (reviewers 1, 2, 3) on the researcher's proposed research technique, taken together, were serious enough to warrant documented resolution in the proposal summary. The section chief said that he had reviewed this file prior to award but apparently did not recognize the reviewers' comments, because if he had he would have required that the comments be resolved and the resolution be documented in the file.

Following are examples of other adverse peer reviewer comments that were not addressed on the proposal summaries in other awards in our sample. In one award two peer reviewers said the proposal budget was overstated compared to the proposed level of work. The proposal was funded at the level requested by the researcher. Peer reviewers also raised questions regarding the research technique in the proposal. None of these peer reviewers' comments was addressed on the proposal summary. A Foundation official involved in reviewing this award advised us that the peer reviewer comments concerning the research technique and the budget should have been addressed in the summary. Other comments not resolved on the proposal review summaries of several other awards in our sample included the following:

Award A

Reviewer 1

* * * * *

"I have two serious reservations about this proposal. The first, alluded to above, is that the funds requested are so small relative to the intensive investigations proposed, that most of these activities will transpire after that expedition. * * * As such, it is important to consider how the investigators intend to fund the post-expedition activities * * *.

"Secondly, assuming that the first reservation could be dismissed, I do not personally consider this 'shotgun' approach * * * a very viable strategy. * * *"

Reviewer 2

* * * * *

"* * * This proposal is systematically naive. The 'need' for a shotgun survey in an exceedingly diverse coral reef assemblage is not defended. * * *

* * * * *

"This proposal is seriously deficient in not saying what organisms will be studied and why. * * *

* * * * *

"All of the work described could just as well--and probably more efficiently--be done at the applicant's home institution. Glaringly omitted from the proposal is the major significance of the work, namely, integration and comparison of an additional isozyme system with the others being studied [sic] in the same fishes."

* * * * *

Reviewer 3

* * * * *

"The weak side of this proposal is the lack of central direction. There is no indication of what will be done to assess and correlate the diverse data to be collected. * * * there seems no indication of plans to get together and discuss their findings. Without such an attempt to tie things together, the proposal sounds like a request to collect data under pleasant surroundings, * * *"

* * * * *

Reviewer 4

"* * * Indeed, the prolixity of the investigators arouses curiosity. Do they too wonder about its merits, or fear that it smacks of a 'boondoggle'? There is no unifying theme * * * Each investigator proposes to do 'his thing' with 'his enzyme system.' * * * Doubtlessly this proposal will generate new observations on * * *, but some of these findings could be difficult to interpret * * *. We are not given any indication of what sorts of samples in terms of numbers of species, or animals within a species will be sought. Nor why all of these investigators need be on the * * * if, as most assert, the bulk of the laboratory work will have to be done in their own laboratories. * * *

"* * * I see no justification for the unspecified additional persons * * *."

* * * * *

Award B

Reviewer 1

"* * * there is no reference at all to indicate that the p.i. (principal investigator) is aware of the work done in the past, in and on his study area. Most important, * * * contains a wealth of data, analyses, and valid ideas which should not be disregarded in any * * * investigation * * *."

"* * * it appears strange that NSF [National Science Foundation] should pay the salary for a meteorologist of the U.S. Navy to gather field experience by two trips to the Antarctic."

Reviewer 2

"* * * I must say, though, that little, if any, solid evidence is presented for the importance of mesoscale events in the McMurdo area. As written, the proposal sounds like a fishing expedition. * * * Also, even with the help of satellite data, the Antarctic seems a difficult area in which to be searching for mesoscale events in view of the paucity of surface and upper air data."

* * * * *

Reviewer 3

"* * * but the proposal is inadequate in explaining the approach and methods to be used. It is difficult to see what specifically the author proposes to do. * * *"

* * * * *

Award C

Reviewer 1

* * * * *

"* * * He has not, however, demonstrated that this will, in fact, be a reasonable system to study. Although he has demonstrated that the number of ribosomes vary with stage of growth, he does not know anything about the state of ribosomal protein mRNA or the rate of ribosomal protein synthesis. These data are essential to his theory and germane [sic] to the question he proposes to test."

* * * * *

Reviewer 2

* * * * *

"However, I am troubled by two factors which are interrelated: (1) these studies are being attempted by others who are having great difficulty as pointed out in the proposal; and, (2) these studies are in order of magnitude more complex than the ones which the principal investigator has performed previously * * * In particular, the analysis of mRNP is fraught with difficulty.

"In summary, the proposal and general system seem reasonable but the feasibility and overall significance of these experiments in this system are somewhat questionable."

Award D

Reviewer 1

"I was somewhat disappointed with this proposal. * * * this proposal is poorly written and the author seems to have some difficulty organizing his thoughts. * * *

* * * * *

"In conclusion it should be stressed that * * * has done excellent work in the past and the rating of very good is given based upon his past success. However, I would be loath to recommend an award * * * for a proposal as brief and incompletely thought out as this one. Since the starting date, * * * is so close, perhaps interium [sic] funding could be provided while a more detailed proposal is prepared."

Reviewer 2

* * * * *

"Summary. This reviewer agrees that the P.I. [principal investigator] is competent and has done good work. However, the implication that the proposed work should essentially be funded on trust is somewhat difficult to swallow."

* * * * *

Reviewer 3

"* * * In general, I praise the P.I. [principal investigator] for his energy and ideas, but fault him for some of his experimental techniques and naivete of interpretation.

* * * * *

"I must strongly disagree with the last paragraph * * * It is hard to find a scientific reason for the claim in this paragraph, and one is tempted to suppose that it was motivated by nonscientific ones.

"To reiterate, the work proposed by * * * is certainly interesting and imaginative, but the difficulty of sorting out the wheat from the chaff in his earlier work poses problems of evaluation to this reviewer. * * *"

* * * * *

Reviewer 4

"* * * However, it is disappointing to see that he does not follow the lead of previous work * * * and does not attempt to extract all the information from his diffraction [sic] evidence. * * *"

* * * * *

Proposal summaries of peer review comments for declinations

The Foundation's October 1977 instruction on preparing proposal summaries for recommended awards also contained the instruction for preparing proposal summaries for recommended declinations. Although this new instruction for declinations contained some wording changes from the previous one, the intent is unchanged. The new instruction states:

"For declinations, summarize reviews and briefly justify the recommendation unless low ratings are the sole basis for declination * * *"

The Foundation's senior science advisor and the director of the Office of Audit and Oversight advised us that program officers should show, on the proposal summary, why the proposal was declined. They also said that when mixed peer

reviews are received (some favorable and some not so favorable) the favorable reviews should also be addressed.

Several proposals in our sample that were declined received mixed reviews. The reviews supporting the proposals, however, were not always addressed on the proposal summary. For example, two proposals that were declined received both ad hoc and panel reviews. For the first, the ad hoc ratings were one excellent, one very good to excellent, three very good, one good, and one poor. The proposal summary stated that the proposal was declined because of the panel members' ratings. However, there was no documentation in the file on panel reviews or a panel summary. The proposal summary did not address the content of the ad hoc reviewers' favorable ratings.

For the second proposal, ad hoc reviewers' ratings were one excellent, one very good to excellent, two good, one fair, and one poor. Panel reviewers' ratings were one excellent, one very good, and one good. The content of the ad hoc and panel reviewers' favorable ratings was not addressed in the proposal summary. The proposal summary also shows lower ratings for two of the three panelists. The summary shows that two panelists rated the proposal as good and as good to very good. The ratings shown on the panelists' review were excellent and very good, respectively.

CONCLUSIONS

The selection of peer reviewers and the disposition of their comments are critical elements in the proposal evaluation process. These elements must be administered with a high degree of credibility to assure that each proposal submitted to the Foundation receives a thorough, fair, and equitable review. The key individual in the proposal evaluation process is the program officer. By necessity, Foundation officials at higher review levels rely greatly on the program officers because of the large number of proposals evaluated and because the particular science area of each proposal is not always within the reviewing officials' areas of expertise.

Except for one directorate, Foundation proposal files in our sample did not contain information on why peer reviewers were selected. Our interviews with Foundation reviewing officials show they did not always know why reviewers were selected. Reviewing officials would often have to contact the program officers to determine why peer reviewers were selected, which might not always be practical

because of the high volume of proposals or because the program officer may no longer be with the Foundation.

The Science Education directorate uses a form called the proposal review plan which shows, or could show, reviewing officials the reasons why peer reviewers were selected, the critical elements of the proposal, and the reviewers selected to comment on those elements. This form--which could be adapted for use by other directorates for all proposals--provides the Foundation a mechanism for documenting these important factors.

Two of the Foundation's six directorates require that program officers document the disposition of all peer reviewers' adverse comments in the proposal file when recommending that a research proposal be funded. The other four directorates merely leave this decision to the program officer; therefore, reviewing officials might not always know the disposition of adverse peer reviewer comments. As with peer reviewer selection, a thorough review should be made of the disposition of adverse peer reviewer comments for each proposal which is funded.

We found similar documentation problems in the Foundation's files of proposals that are not funded. Favorable reviews of a proposal are not always being addressed by program officers in the proposal file; therefore, the basis for the declination decision is not apparent. The Foundation's instruction for documenting reviews when a proposal is declined does not specifically state that favorable reviews should always be addressed, although, according to Foundation officials, this is the intent of the instruction. Clarification of the instruction is needed to insure that program officers are aware of the documentation expected to support a declination decision.

In summary, reviewing officials must be able to easily evaluate before the final decision is made whether a recommendation to fund or decline a proposal was made in accordance with Foundation policies and procedures. The extent of documentation in the Foundation's proposal files that we reviewed does not always clearly support the recommendation or facilitate evaluation of the program officers' recommendations. Further, responsibility for the Foundation's primary quality control system for the proposal evaluation process rests with the Office of Audit and Oversight. Under this arrangement, the quality control system will be administered on a post-award, post-declination basis. The lack of adequate documentation of peer reviewer selection

and of disposition of reviewers' comments in the proposal files could make this group's task extremely difficult without extensive interviewing of program officials. At times, interviewing might not be possible, particularly if the program officer has left the Foundation. Since the vast majority of all the research proposals that are submitted to the Foundation are processed by those directorates that require little or no documentation, the problems the post-award group faces could be substantial.

Some suggestions for documentation procedures

We recognize that many of the Foundation's program officers handle a large number of proposals. Some handle up to 200 proposals each year. Therefore, any additional requirements placed on program officers to document their decisions should be easily accomplished and require a minimum of extra effort.

Program officers should devise an evaluation plan for each proposal as a basis for selecting reviewers and show those reviewers selected to comment on each element in the plan. In documenting peer reviewer selection, program officers already consciously determine why they select certain reviewers as related to particular elements in the proposal. By documenting these decisions in the proposal files reviewing officials will know whether all elements considered essential in the proposal were covered in the peer reviewers' responses. This information can easily be captured on the form now used by the Science Education directorate.

Also, documenting the disposition of peer reviewers' adverse comments on award recommendations could be done with a minimum of additional effort by program officers. Adverse comments could be numbered consecutively and then grouped for comment on the summary review sheet. The numbers of those not warranting detailed response by the program officer could be listed and a general explanation given. Those comments requiring more detailed response should be explained.

AGENCY COMMENTS AND OUR EVALUATION

We proposed that the Foundation (1) issue instructions requiring that proposal files document the reasons each peer reviewer was selected and, for proposals which are funded, the disposition of all reviewers' adverse comments and

(2) clarify its instruction on documentation required for proposals that are not funded to include a discussion of why the favorable reviews of the proposal were discounted and the reasons why it was declined.

By letter dated June 14, 1978, the Foundation advised us that it did not believe the documentation required by our proposals would better assure fairness and equity in the proposal evaluation process. The Foundation concluded that it has sufficient pre-award and post-award checks to assure fairness in proposal evaluation and that detailed documentation of reviewer selection and comments would be costly. Supporting reasons given by the Foundation included:

- Program officers are presumed to be professionally competent and responsible, and their actions are reviewed by higher level officials--who are also scientists--who can assure compliance with policies and procedures.
- Researchers who are concerned about the disposition of their proposal can request the anonymous peer reviewers' comments and then formally appeal the Foundation's decision to higher management levels within the Foundation.
- Oversight groups (the Office of Audit and Oversight and advisory committees) conduct a post-review of the program officers' performance in evaluating proposals.
- Comprehensive studies have shown the peer review system to be "eminently fair."

Pre-award controls

The Foundation stated that a program officer's recommendation on each proposal is reviewed by a section head and/or division director who is a scientist and is responsible for reviewing the underlying justification, including the peer reviewer assessments. The award recommendations are further reviewed within the Directorate by the assistant director or deputy assistant director. The Foundation commented that all of these individuals can determine the effectiveness of the review and the appropriateness of the recommendation.

Peer review is the heart of the Foundation's proposal evaluation process. However, for many proposals the peer reviews are not all favorable or all unfavorable. Consequently, there usually is not a seemingly clear-cut view of

the proposal. Rather, many proposals fall into the middle ground, having received some good and some not-so-good reviews. In addition, even reviewers who give proposals excellent or very good ratings will also frequently criticize sections of the proposals. The program officer must decide whether to fund or decline the proposal after weighing the peer reviewers' comments along with other considerations. This is especially difficult for the program officer since many of the proposals receive middle-of-the-road ratings. The peer reviews, by themselves, usually will not overwhelmingly support the decision one way or the other.

Review by higher level officials of the program officers' decisions on many of the proposals is very important. Otherwise, the program officer becomes the only official determining the final action taken on many proposals the Foundation acts on. Further, as noted in the Foundation's letter, one-third of the program officers at the Foundation (called rotators) serve on temporary appointments. These appointments last from 1 to 2 years. Because rotators are inexperienced in Foundation procedures and leave within a relatively short period of time, it is even more important that reviewing officials have sufficient information to assure that the rotators' decisions are fair and were made in accordance with established procedures (particularly for many of the proposals where the program officers decide which of the proposals that receive mixed peer reviews will be funded).

Recommended actions on proposals are reviewed by officials at several levels above the program officer. However, our review showed that many of these officials do not have enough information (or time) to assure that each proposal receives equitable consideration. Foundation officials responsible for reviewing program officers' decisions on proposals (section heads and/or division directors) do not always know why peer reviewers were selected or how reviewers' comments were resolved, since the proposal files (prepared by the program officer) do not always contain sufficient information showing why or how the decisions were made.

The sheer volume of actions reviewing officials must handle in many instances precludes all but the most cursory check on the program officers' decisions. Consequently, the Foundation's reviewing officials cannot assure that Foundation policies and procedures were followed on every proposal or assure that each proposal received equitable consideration. They must rely heavily on the program officers for these assurances.

The Foundation stated in its letter that our report reflects an auditor's viewpoint: that is, scientific and managerial decisions should be recorded to permit construction of an "audit trail." However, we noted that the Foundation's own scientists, who review program officers' decisions, also need more information to determine whether Foundation policies and procedures are followed, since the information currently required in proposal files is not always sufficient. Our recommendations that the Foundation require additional information in each proposal file showing why peer reviewers are selected and how their comments are handled will provide the Foundation's reviewing officials, and others, a better basis to assure that each proposal receives equitable consideration.

Post-award controls

The Foundation stated that the program officers' decisions are subject to challenge or review after the decision has been finalized by three mechanisms: (1) appeal of the final action by the researchers, (2) the Foundation's Office of Audit and Oversight, and (3) advisory committees of experts external to the Foundation.

The Foundation stated that researchers who are concerned about the decisions made on their proposals can request copies of the anonymous, verbatim peer reviews of their proposals and, if they disagree with the disposition of the proposal, appeal the decision through the Foundation's formal appeals process. Placing such reliance on the appeals mechanism to help insure accountability over the program officers' actions is not realistic. During the annual authorization hearings in the Congress, Foundation officials said the formal appeals mechanism is viewed by the Foundation as the "case of last resort" for the researcher.

Very few researchers whose proposals are declined appeal the decision. For example, the Foundation declines over 12,000 proposals a year. However, according to Foundation statistics, researchers only appeal about 53 decisions annually. Researchers might not appeal a program officer's decision for fear of jeopardizing their chances for getting favorable decisions on future proposals if the same program officer whose decision was "challenged" in the appeals process would also be reviewing future proposals. Another possible inhibitor is the requirement that the researcher have a letter signed by a top official of the university before the appeal will be considered by top Foundation management.

The Foundation stated that a post-audit examination is made by its Office of Audit and Oversight (discussed on p. 18) of a 10-percent sample of all program actions to help assure that fair and unbiased decisions are made on proposals. The office's review occurs after actions are finalized.

As of July 1978, according to the office's director, the office had one person who was responsible for reviewing a 10-percent sample of the approximately 24,000 proposal actions the Foundation processes annually. According to the office's director, this person also has other responsibilities. Because one-third of the Foundation's program officers whose proposal actions would be subject to examination serve only temporary appointments, it is likely that many of these "rotators" could have left the Foundation by the time the office's reviews of proposal decisions are made.

The Foundation stated in its letter that: "A complete understanding of the action on a particular proposal requires a knowledge of the range of proposals considered. This is especially true of declinations at the borderline since many quite good proposals must be declined." The Office of Audit and Oversight is examining only a 10-percent sample of all proposal actions. Therefore, it is questionable how it could determine whether an adequate peer review was obtained or how reviewers' comments were handled on a specific proposal without reviewing all the proposals that were considered, which, according to the office's director, it is not doing. Also, even reviewing officials in the same or similar scientific disciplines cannot always determine why peer reviewers were selected or how reviewers' comments were handled. This raises doubts as to how the office could do this, without such information being in the proposal files.

The Foundation stated that, in addition to a 10-percent sample of proposal actions being reviewed by the Office of Audit and Oversight, each of the Foundation's programs would be periodically examined by advisory committees made up of experts in the area of the program who are external to the Foundation. The advisory committees would examine a sample of proposal files in conducting their reviews. The Foundation said the advisory committees' examination of the selection of reviewers and the adequacy of the reviews is the most effective way to review the appropriateness of and assure the accountability for decisions made regarding the peer review of proposals.

A Foundation instruction dated April 20, 1977, formally required a periodic review of each program by an advisory

committee. The advisory committee members, according to Foundation officials, are selected by persons in the programs the committees review, although the selections are approved by directorate heads and by the Foundation's Director. The instruction did not establish a time schedule showing how often each program would be reviewed or when each program should be reviewed. The instruction did not require the committees to examine the adequacy of the selection of peer reviewers or how reviewers' comments were handled. Questions to be considered by the committees were left to the discretion of the head of each directorate, except that a minimum set of questions would be required, although not specified in the instruction. The instruction required that each directorate develop an implementation plan for reviewing all programs on a periodic basis.

As of July 1978, according to the director of the Office of Audit and Oversight, none of the directorates had an implementation plan showing when each program would be reviewed by an advisory committee. Our review of the advisory committee reports, available as of July 1978, on programs that had been reviewed showed that many of the committees apparently did not conduct indepth reviews of individual proposal files to determine the adequacy of peer reviewer selection. Less attention was focused on how peer reviewers' comments were handled.

The review criteria and methodology varied from committee to committee. Some committees' procedures did not require a review of peer reviewer selection or how peer reviewers' comments were handled. One committee reviewed three of seven programs under its jurisdiction, whereas another committee looked at all programs in its area. The scope and depth of the committees' reviews appeared limited. One committee reviewed 15 proposal actions for each of three programs under its jurisdiction. Four programs were not reviewed. The reviews were done by two or three persons. The committees had only 1 or 2 days in which to conduct all business, of which proposal review was only a part. The information in the reports of the committees' review results varied. Some of the reports of the committees that reviewed the adequacy of the peer reviewers selected or how peer reviewers comments were handled contained little information on the committees' findings.

The Foundation's post-award controls, if properly implemented, could provide useful checks on the proposal evaluation/peer review process. The controls as presently

operating do not appear to assure that all proposals receive equitable consideration. In addition, if the post-award controls were operating effectively, they still would not be a suitable substitute for pre-award controls to assure accountability over decisions made on proposals before the decisions are finalized. Sufficient information is needed in each proposal file to show the rationale for the decisions made by the program officers, so that higher level officials reviewing the program officers' decisions can assure that applicable policies and procedures were followed and that each proposal received equitable consideration.

Comprehensive studies

The Foundation stated that our report ignored the comprehensive studies which have shown the peer review system to be "eminently fair." In response to our request, the Foundation provided us three studies it used as a basis for its assertion. Our review of the studies showed that they did not reach definite conclusions regarding the fairness of the peer review system. The studies noted that additional studies were underway or were needed to determine whether the Foundation's peer review system is equitable.

One of the studies, dated October 1, 1973, was the result of a 2-day meeting held by a task group of the Foundation's Advisory Committee for Research. The task group had asked the Foundation for descriptions of the peer review system used by various offices and sections and for information on the nature and seriousness of complaints about the system each office or section had received. The task group was briefed by several division directors on their peer review systems.

From this information the task group concluded that the peer review systems seemed generally satisfactory. However, the task group's conclusion in its report was qualified. The task group concluded that the number of written complaints the Foundation had received from scientists about the peer review system might not be representative because some scientists might not complain because of fear of adverse consequences. The task group made several suggestions for changes in the Foundation's peer review systems and suggested that a more comprehensive study be undertaken to, among other things, identify any biases or discrepancies in the Foundation's peer review system.

The second study provided us by the Foundation was a November 1977 report made to the Subcommittee on Science,

Research, and Technology by the Foundation's National Science Board. The study addressed eight areas of concern to the Subcommittee about the Foundation's use of peer review. The report's overall statement was that "the NSF peer-review system is in general an equitable arrangement that distributes limited funds available for basic research primarily on the basis of the perceived quality of the applicant's proposal." This statement was based on information obtained from the results of another study (not a final report at that time) which was published in a scientific journal in October 1977. However, the preliminary edition--issued in May 1978--of the final report of that study does not support the conclusion quoted above. (The preliminary edition is discussed below; it was the third study the Foundation gave us to support its assertion in its letter.)

The Board's November 1977 report also mentioned two other studies of the Foundation's peer review system. Neither of these studies concluded that the Foundation's peer review system was eminently fair. One of the two studies included information on a random sampling of researchers' (who had submitted proposals to the Foundation) perceptions of the peer review process as it was operating in late 1975 and early 1976. The study showed that a majority of the researchers whose proposals were not funded believed the decision to decline their proposals was unfair. The study also showed that a majority of all researchers sampled believed the Foundation's peer review process favors proposals from well-established researchers and from well-known institutions.

The third study provided us by the Foundation was the preliminary edition of the final report, dated May 1978, of a study of peer review in the Foundation conducted for the National Academy of Sciences (under a contract from the Foundation). As previously noted, the study's preliminary results were published before the final report. The report contained several findings regarding the relationship of certain variables to (1) researchers' scientific achievements, (2) researchers' location and age, (3) the peer reviewers' ratings of a sample of the researchers' proposals, and (4) the actions taken on the proposals by Foundation program officers. The report contains the following qualifier regarding the use of the results of the study.

"* * * Where does the peer review system in practice diverge from the formal statement of how peer review is supposed to work? Our data are well suited for throwing light on this question, and also for pointing up problems with peer

review. Problems were revealed in discussions with the people administering the peer review system, and by close analysis of the quantitative data. The research is not suited for definitively answering the question whether the peer review system is an 'equitable' one. Although our data allow us to speculate usefully on this question a more definitive answer awaits the completion of Phase II of our research." [Underscoring added.]

Phase II of the study, according to an Academy official, will not be completed until 1979.

Other matters

The Foundation stated that the consistent documentation required in the proposal files is not needed from one directorate to another because of the difference in the programs and that our proposed recommendations would require a "greatly increased amount of documentation" and be very costly to implement.

The Foundation noted that certain Science Education and Policy Research programs document reasons for selecting reviewers because of concerns which extend beyond the scientific quality of the researcher and the research project. The "difference" between programs where only scientific merit is the overwhelming concern and those where factors other than scientific merit are the major concern, according to the Foundation, appears to be the reason some proposal files show why reviewers are selected and how all comments are handled.

The difference between programs should not be the determining factor regarding the evidence that should be in a proposal file showing the disposition of peer reviewers' comments or the reasons reviewers were selected. Currently, the two directorates whose programs include science education and policy research require that the disposition of all peer reviewers' comments be shown in the proposal files for all programs in the directorates. One of the directorates also requires information on why the reviewers were selected for all its programs. Each of these directorates has basic research programs where scientific merit is presumably the overwhelming concern, but each requires the same level of evidence on disposition of reviewers' comments that is required for other programs. In these two directorates the distinction between the type of program has no bearing on

the level of evidence required in the proposal files. According to directorate officials, all programs, including basic research, are required to follow the same documentation standard.

Currently, the proposals processed by these two directorates represent only a small portion of the total number of research proposals processed and, consequently, a small portion of the total research funds awarded each year by the Foundation. Similar documentation is not required in those directorates which award the bulk of the Foundation's grant funds. Accountability over the peer review process, as a result, is greatest for only a small portion of proposals the Foundation receives. The lack of consistency in the standards required for accountability among the Foundation's many grant-awarding units does not assure that equal treatment is given to each proposal.

We are not proposing that the Foundation require a "greatly increased amount" of documentation in the proposal files regarding selection of reviewers and disposition of their comments. As previously noted (see p. 23), a form is already used in the Foundation's grant-awarding directorates which shows the peer reviewers selected. As a result, the amount of paperwork would not be greatly increased. Also, program officers certainly know the reasons they select peer reviewers for each proposal. All we are proposing is that they record these reasons on the form already in use.

Regarding the additional documentation that would be required to show the disposition of peer reviewers' comments, the Foundation already requires that a form be used by program officers to record how reviewers' comments are handled. As discussed in this chapter, the extent to which the disposition of all comments is recorded varies. We are recommending that greater uniformity be established among and within the directorates regarding the extent that program officers show evidence in the files of the disposition of reviewers' comments. Some extra effort will be required of certain program officers who are not now showing the disposition of many comments. We are proposing that program officers be required to record the results of their determinations on the form already in use.

The Foundation said it would reexamine the wording in its instruction on the disposition of peer reviewers' comments but disagreed with the level of documentation we proposed. As previously noted (see p. 23), the current instruction is too vague; it allows program officers wide latitude in determining those comments for which the disposition should be recorded.

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Chapters 2 and 3 of this report cite examples of peer reviewer comments we considered important but were not addressed in the proposal files. The adverse comments on proposals that were funded included such matters as potential duplicate research, adequacy of the proposed research methodology, and general importance of the proposed research. Also included in this report are examples of proposals that were declined (not funded) but that received mixed peer reviews (favorable and not favorable). However, the favorable reviews were not addressed in the proposal files in justifying the declination actions.

In commenting on the report, the Foundation provided an attachment to its letter acknowledging that some of the reviewers' comments were significant and should have been addressed in the proposal files. The Foundation explained in the attachment why other comments were not addressed in the proposal files. However, in many cases the Foundation's explanation is contradicted by peer reviewers' comments or other information in the proposal files, or is inadequate regarding the disposition of the comments. Accordingly, we believe that the resolution of the peer reviewers' comments cited in our report should have been addressed in the proposal files and that the Foundation needs to better account for the disposition of peer reviewers' comments.

RECOMMENDATIONS

We recommend that the Director, National Science Foundation:

- Issue an instruction requiring that proposal files contain adequate documentation to show the (1) critical elements in each proposal to be evaluated and the relationship between these elements and the reviewers selected and (2) disposition of all peer reviewers' adverse comments or constructive criticisms when program officers recommend funding proposals.
- Modify the Foundation's instruction on summarizing peer reviews when proposal funding is declined to require an explanation of (1) the peer reviews which support funding the proposal and (2) why the proposal was declined.

CHAPTER 4

POLICY ON RELEASE OF

VERBATIM PEER REVIEWER

COMMENTS IS NOT UNIFORMLY APPLIED

Foundation policy provides that researchers will be sent, upon request, copies of all peer reviewers' verbatim comments made to the Foundation during the proposal evaluation process. Although the Foundation intends that the policy be uniformly applied for all requests, we found that Foundation officials had varying interpretations regarding what should be sent to researchers. As a result, researchers who request the comments are not always sent all comments made by peer reviewers.

FOUNDATION PROCEDURE ON RELEASING PEER REVIEWER COMMENTS TO RESEARCHERS

In June 1975, the National Science Board adopted a policy permitting researchers to receive, upon request, the verbatim peer review comments made to the Foundation in the review of proposals and the reasons for the decisions on the proposals. The policy was established to provide more information to the scientific community on the Foundation's use of the peer review process and on the reasons behind the Foundation's decisions on proposals.

The Foundation's procedures implementing the Board's policy became effective for peer reviews requested by the Foundation after January 1, 1976. The procedures, as stated in the "Guidelines for Program Officers on Release of Proposal Review Information in Response to Requests From Principal Investigators/Project Directors," dated February 26, 1976, provide that the following types of documents would be sent to researchers who request verbatim written comments.

- "1. Written reviews and ratings of the proposal, including those from Foundation staff or other Federal personnel, which were solicited as peer reviews by the procedures normally used in the program. This includes letters accompanying reviews.

- "2. Other documents containing peer reviewer comments on the technical or scientific content of the proposal or scientific competence of the applicant.
- "3. Diary notes of telephone discussions with reviewers concerning the proposal, after obtaining concurrence by the reviewer in the accuracy of the diary note.
- "4. Summaries of committee or panel discussions.
- "5. Written reports by peer reviewers of site visits made in connection with the evaluation of the proposal."

In December 1977, the Foundation Director's senior science advisor and the director, Office of Audit and Oversight, advised us that the intent of the policy is to provide researchers all the documents that are subject to release without researchers having to specifically request each item available.

VARYING INTERPRETATIONS OF THE FOUNDATION'S POLICY

Our review of the implementation of the Foundation's policy in four divisions in three directorates which award research grants showed varying interpretations of what is to be sent to researchers. One program director told us that when researchers make requests he provides only those comments on the peer review form completed by the reviewers. Other comments he receives from peer reviewers, such as those made in cover letters, are not provided because he considers them personal communication. Foundation instructions, however, state that comments in letters will be provided. A program director in another directorate said that peer reviewers are allowed to rescind comments they made but did not include on the peer review form before any comments are sent to researchers. Foundation instructions do not provide for such "screening."

Examples of peer reviewer comments not provided to researchers

In our sample of 18 proposals that were declined, we found evidence in the files of 11 that researchers had requested copies of the verbatim peer reviews. Since the

files usually do not show what was sent to researchers, we contacted three to find out what they received. Two of the three did not receive all the comments that were in the file; the third did not want to discuss the matter.

One researcher whose proposal was declined did not receive copies of the cover letters that two peer reviewers used to transmit their reviews to the Foundation. The reviewers' comments in these letters were not included in their written reviews. One letter stated:

"The proposed retrieval system is interesting, but there's not enough justification for me to recommend approval. The question is whether his idea of matrix location will really work. Besides the problem of judgment universality mentioned in the review, there are a host of technical questions I didn't state for fear of cluttering the review statement. For example, are the term frequencies and rating sufficiently discriminatory to really separate unlike things in a large data base? The applicant just doesn't provide enough information.

"Without being presumptuous, may I suggest that a site visit might be appropriate if, based on other reviews, there is the belief and likelihood that answers do exist and they should and can be pursued. Alternatively, maybe another application is the only solution."

Another reviewer's letter stated:

* * * * *

"The author has done some research in the area of automata theory and formal languages. He does not seem to have sufficient background in information retrieval and interactive computing which are needed to make his proposed research more useful.

"My recommendation is that the proposed project should not be funded in its present form until the author can obtain some concrete results from his current NSF [National Science Foundation] project and show that his approach is really better than the retrieval systems which have been developed. I recall that the author submitted a similar proposal to DOD [Department of Defense] a year ago. I understand that it has been rejected."

The cognizant program officer told us that peer reviewers' comments not on the review form are not sent to researchers.

According to our analysis, the other researcher we contacted did not get some, and possibly the most pertinent, peer reviewer comments the Foundation received. Also, the Foundation took 6 months to provide the comments. Peer reviewers' comments included six ad hoc reviews, three panel reviews, and one panel summary. However, our analysis of the comments the researcher told us he received shows that he did not receive portions of two ad hoc reviewers' comments, the comments in one reviewer's cover letter, and the three panel members' written reviews or the panel summary.

The program officer that processed this proposal had left the Foundation by the time of our review. The incumbent program officer and the cognizant division deputy director advised us that division policy prohibited sending researchers peer review panel members' written reviews. The deputy director said the division was following Foundation policy in withholding panel members' reviews. The incumbent program officer told us that it was simply an oversight that the researcher did not receive all the ad hoc reviewers' comments or the panel summary.

A director of another division in the same directorate advised us that researchers are sent upon request both the ad hoc and panel members' comments. However, the panel summary is not sent to the researcher unless the researcher specifically requests it.

CONCLUSIONS

Foundation instructions on the release of peer reviewer comments clearly state the types of documents program officials should send to researchers who request peer reviewers' comments on their proposals. Program officials are not, however, following the instructions, resulting in varying practices regarding the documents that are sent to researchers. Interpretations of the Foundation's instructions vary among and within the directorates. Noncompliance with this policy undermines the Foundation's objective to provide more openness and accountability in the proposal evaluation process.

AGENCY COMMENTS AND OUR EVALUATION

We proposed that the Foundation develop internal controls to assure that researchers who request peer reviews of their proposals are provided all reviews and related information specified in the Foundation's guidelines.

By letter dated June 14, 1978, the Foundation advised us that it has taken actions to assure that the policy on the release of peer reviewer comments was being followed. According to the Foundation, assistant directors have examined the practices of their staffs, and misunderstandings regarding the Foundation's policy on the release of peer reviewers' comments have been corrected. The Foundation said that its Office of Audit and Oversight will make spot checks to ensure compliance.

We do not believe that the Foundations's actions will preclude repetition of the problems we identified. The spot checks made by the Office of Audit and Oversight will occur sometime after the requests for peer review comments have been acted on. Internal controls have not been established to assure that program officers send researchers all comments to which they are entitled at the time the request is filled. There are over 300 program officers in the Foundation, and they handle the requests for peer review comments. No concurrent review of the officers' responses is usually required.

Making spot checks after the fact does not adequately assure that the Foundation's guidelines will be followed. Controls are needed at the time the requests are filled in every Foundation program. Assuring compliance with a basic operating policy such as release of peer reviewer comments is also a program responsibility, not just an audit function. The Foundation needs to establish internal controls over researchers' requests for peer review comments which will assure that all comments are sent as provided by the Foundation's policy when the request is acted on.

RECOMMENDATION

We recommend that the Director, National Science Foundation, develop internal controls to assure that program officials provide researchers who request peer review comments all the documents specified in the Foundation guideline dated February 26, 1976, on the release of proposal review information.

CHAPTER 5

SCOPE OF REVIEW

We reviewed the Foundation's action review boards to determine their effectiveness in assuring compliance with Foundation policies and procedures by officials responsible for evaluating proposals for research support. We were specifically concerned with the boards' effectiveness in considering the (1) selection of peer reviewers, (2) instructions provided to peer reviewers, (3) resolution of peer reviewer comments, and (4) the justification for decisions to fund or decline proposals.

In conducting the review, we

- interviewed Foundation officials, especially those associated with the proposal evaluation process;
- reviewed the minutes or other documents, where available, of the sessions of the Foundation's action review boards;
- examined Foundation and individual directorates' procedures for evaluating proposals and operating the boards;
- attended board meetings and panel meetings on proposals;
- gathered statistical data on the activities of the research directorates for fiscal and calendar year 1976;
- contacted certain researchers regarding proposals they had submitted to the Foundation; and
- reviewed the files of 74 proposals, of which 56 were funded and 18 were declined, to determine the extent of compliance with certain Foundation policies and procedures.

The selection of the 56 proposals that were funded (a grant was awarded) was made by choosing awards made by each research directorate from the Foundation's December 1976 and January 1977 monthly reports of grants and contracts awarded. The 18 declinations were selected for each directorate from the October, November, and December 1976

monthly reports. The volume of awards selected was based on the greater of one-half of one percent of all awards made by each research directorate in calendar year 1976, with a minimum of five awards. Files we selected represented small and large universities, private organizations, large and small dollar amounts, yearly and multiyear funding periods, and a mixture of proposals from various divisions within each of the directorates.

The review was conducted at the National Science Foundation in Washington, D.C.

GAO REPORTS ISSUED SINCE OCTOBER 1975WHICH DISCUSSED THE FOUNDATION'SPROPOSAL EVALUATION PROCESS

1. Administration of the Science Education Project "Man: A Course of Study" (MACOS) (MWD-76-26, Oct. 14, 1975).
2. Opportunities for Improved Management of the Research Applied to National Needs (RANN) Program (MWD-75-84, Nov. 5, 1975).
3. Representation of Peer Review Comments for the National Science Foundation's Individual Science Instructional System Project (MWD-76-78, Jan. 12, 1976).
4. Management of a National Science Foundation Office of Energy R&D Policy Grant to the George Washington University: Questions, Answers, and Recommendations (HRD-77-38, Jan. 25, 1977).
5. Curriculum Case Studies Are of Questionable Quality But Helped Precollege Curriculum Activities (HRD-77-46, May 2, 1977).

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550**nsf**

June 14, 1978

OFFICE OF THE
DIRECTOR

Mr. Gregory J. Ahart
Director
Human Resources Division
General Accounting Office
Washington, D. C. 20548

Dear Mr. Ahart:

We appreciate the opportunity to review and comment on your draft report, "Accountability in the National Science Foundation's Peer Review Process Needs Strengthening." We have reviewed the draft with members of your staff and our comments and views are summarized below.

The draft report reflects a GAO view that scientific and managerial judgment should be reduced to a form which permits auditors to construct a traditional "audit trail" of paper.

The Foundation's success based on the philosophy of getting the best scientists it can find to serve as Program Directors, provides flexibility in procedures so that the staff can be responsible to differing program needs, and to rely heavily on the judgment of this staff, with checks and balances at various points to assure fairness. About one-third of the program staff is serving temporarily while on leave from nongovernmental scientific positions, primarily in the academic community. External peer review of proposals is of great importance to us in arriving at recommendations for the disposition of proposals but this cannot be done mechanically.

The Foundation starts with an assumption that Program Managers are professionally competent and responsible in evaluating proposals and recommending action upon them. However, Program Officers are accountable for their recommendations. Each recommendation is reviewed by a Section Head and/or Division Director who is also a scientist and whose job it is to review the justifications underlying the recommendation, including but certainly not limited to reviewer assessments. Award recommendations are further reviewed by Assistant Directors or Deputy Assistant Directors. All of these individuals can determine the effectiveness of the review and the appropriateness of the recommendation. The Program Officer also is accountable to the scientific community he serves. Where advisory panels participate in the review process, Program Officers provide the panels with "feedback" as to the disposition of previously reviewed proposals. Oversight groups review the performance of the program officer. Principal Investigators who are concerned about the disposition of their proposal can pursue an appeal of that dispo-

GAO Note: The numbers within brackets in the margins of this appendix are the paragraph/page numbers applicable to this final report.

sition. In short, the Program Officer is making his recommendations in an open arena with many individuals and groups looking over his shoulder. It is this openness which is the essence of the Foundation's peer review and is a major reason that the NSF is highly regarded in the scientific community. The ability of the investigator to review all of the reviewers' comments has added significantly to the openness of the Foundation's peer review system. Since the investigator can review these comments himself, and appeal if he disagrees with the disposition of his proposal, what further purpose is served by requiring that the reasons for selection of each reviewer be documented and individual comments be rebutted? In addition to the various procedures which are carried out before an action is taken, a post-audit examination to help to assure a fair and unbiased decision is made by the Foundation's Office of Audit and Oversight which reviews a ten percent sample of all program actions. Additional procedures requiring detailed documentation of reviewer selection and individual reviewer comments would be very costly, and it has not been demonstrated by GAO that such steps would materially improve the peer review system. The report ignores the comprehensive studies which have shown the system to be eminently fair.

The GAO's stress on the need for "consistency" from one directorate to another carries a worthwhile principle to the extreme by failing to give adequate recognition to the real differences between programs in the several directorates. For example, certain Science Education and Policy Research programs document the reasons for selecting peer reviewers because of special concerns for aspects which extend beyond the scientific quality of the investigator and his or her project which are of overwhelming concern in the selection of basic research projects. We do not agree with the recommendation that each file contain a detailed discussion of the reasons for selecting each reviewer. The objective of our review process is to obtain adequate information on which to base a decision about a proposal. We believe that in most cases whether or not this has been done is clear from the reviews and the departmental backgrounds of the reviewers who function more as "technical referees" than as "advisors." For example, [5/21] the case cited in paragraph 3 on page 26 was also considered by a panel several of whose members were well qualified to comment on the proposal as shown by their written reviews. In addition, as part of our external peer oversight review, members of our advisory committees periodically examine the operation of each program, including a sample of the files on proposals. Among the matters on which these groups comment are the selection of reviewers and the appropriateness and adequacy of the reviews. In our judgment, this examination by technical experts is the most effective way to review these aspects of our stewardship. Even if additional paperwork would be of significant value, anything more than a virtually meaningless pro forma exercise would require a considerable increase in staff.

The purpose of the staff summary is to clarify the basis for the recommended action. We believe that our instructions on disposition of reviewer comments both for awards and for declination may need some revision and are reexamined

ing the wording. However, we feel that the greatly increased amount of documentation recommended by GAO is unnecessary. The Foundation's Office of Audit and Oversight examines the adequacy of program officer comment on reviews in the course of their review of a ten percent sample of actions on proposals and informs the appropriate Assistant Director and his or her staff of any inadequacies in order to correct any misunderstanding as to which reviewer remarks requires program officer comment. This is resulting in improvement. While some of the remarks cited by GAO should have had further comment, many, when taken in the context of the review, do not require such detailed comment. For example, the first comment cited (page 17) states that there is "considerable overlap with our research"; the next sentences in the review discuss the difference in details which show that the overlap is not sufficient to warrant comment by the program officer. Another example is that of "Reviewer 2" on page 34, where the first two excerpts cited refer to a portion of the project which was deleted before funding, as noted in the program officer's summary. Some remarks by reviewers reflect matters of taste and are readily recognized as such, thus not requiring comment; many of the remarks on Award A (pages 33, 34) are of this type. At the top of page 39 it is noted that the panel summary for the proposal under discussion shows ratings different from some panelists' preliminary ratings; it is not unusual for ratings to be changed as a result of panel discussion. It should be noted also that our programs are competitive and budgets limited. A complete understanding of the action on a particular proposal requires a knowledge of the range of proposals considered. This is especially true of declinations at the borderline since many quite good proposals must be declined. A discussion of our views on each reviewer cited by GAO is contained in Attachment 1. The additional, and in our judgment unnecessary, paperwork suggested by GAO for each case would require a very significant increase in our program staff.

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[27,28]

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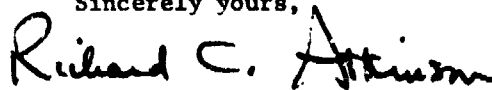
Upon hearing informally from GAO last December that our policies on the release of peer reviewer comments were not being followed correctly, I instructed the Assistant Directors to examine the practices of their staffs and correct the misunderstandings which existed. This has been done. In addition, the Foundation's Office of Audit and Oversight will make spot checks to ensure that we continue to follow the guidelines laid down in our regulations. I appreciate having my attention called to this matter by GAO.

In conclusion we will reexamine the wording of our instruction on the disposition of peer reviewer comments, but we must strongly disagree with the GAO that the additional documentation recommended will better assure fairness and equity in our proposal evaluation process. The specific recommendations seem to result from assumptions about and perceptions of the Foundation's peer review process that are quite different from our views. It has not been demonstrated by GAO that detailed discussion of

*See page 44 of this report for GAO's comments on the attachment.

the reasons for selecting each reviewer and very detailed disposition of individual reviewer comments for awards and declinations would materially improve the Foundation's peer review system.

Sincerely yours,

A handwritten signature in black ink that reads "Richard C. Atkinson". The signature is written in a cursive style with a large, prominent "R" at the beginning.

Richard C. Atkinson
Director
National Science Foundation

(11661)