Institutional Arrangements for the Space Telescope

A Mid-Term Review

Space Telescope Science Institute Task Group
Committee on Space Astronomy and Astrophysics
Space Science Board
Commission on Physical Sciences,
Mathematics, and Resources
National Research Council

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CONTENTS

SUMMARY

The charge to the CSAA Task Group and the responses are summarized below and discussed in detail in the sections noted.

Charge 1: Review the current goals and objectives of the Space Telescope Science Institute in the light of the original expectations outlined in the recommendations of the Hornig Committee and NASA's response.

Response: The goals and objectives for the Space Telescope Science Institute remain valid. The objectives with the agreement of NASA, the Institute, and the Astronomical Community as represented by the Task Group are listed in Section II.

Charge 2: Examine how well the currently perceived needs of the astronomical community will be met by NASA's plans for future development of the ST/ScI.

Response: The Task Group could assess this only in the short range where the needs are clearly being met. In the long range a thoughtful, mutually acceptable plan is essential, and the Task Group recommends that NASA and the Institute begin developing a long-range plan (Section III).

Charge 3: Consider to what extent, if any, the original goals and objectives should be modified to meet current scientific needs. The panel should suggest what should be the scope of the ST/ScI needed to meet the basic scientific requirements outlined above.

Response: The Task Group recommends no modifications of the goals and objectives with the exception of inserting explicitly the phrase "within the available resources" in the goal to optimize the HST science return. The scope of the Institute should be comparable in budget and manpower with other national astronomical facilities. An annual budget of $21 million (in 1984 dollars) is close to the upper limit of this range (Section II).

Charge 4: Take into consideration the appropriate balance of efforts and resources to be provided to the community by the ST/ScI and to be provided by the community in their home institutions.

Response: The home institutions of the observer might be expected to have suitable hardware to handle some of the data analysis. The ST/ScI should facilitate data analysis at the home institution by producing transportable software (Section III).

The AURA management as the contractor with NASA should take an active role in maintaining a productive relationship among NASA, the Institute and the community (see Conclusion 6 and Section IV).

As a result of its study, the Task Group has formed a favorable impression of the ST/ScI's carrying out of the functions identified by the Hornig report as well as its making valuable contributions in identifying and undertaking tasks that were not foreseen at the time of the Hornig report. In its short time of existence, the ST/ScI has created a scientific staff of high stature.

As the HST goes into operation, the Task Group sees a fast pace of exciting activities calling for careful selection in assigning resources. The pace is likely to continue and will call for consultation of the three groups in establishing priorities, with the Institute staff focusing on the science aspects and making use of the resources available at Goddard and its contractors for tasks not directly related to the science.

I. INTRODUCTION

The Hubble Space Telescope (HST), when launched in the summer of 1986, will be the realization of the astronomers' dream of operating an observatory in space. By observatory we mean a telescope with multiple instruments that can be reconfigured on short notice to accommodate new ideas, unanticipated at the time of design. The freedom from the obscuring and image deterioration effects of the Earth's atmosphere will allow observations that will profoundly affect the way we perceive the universe. We expect that the advances in our understanding of the Universe made possible by this first permanent observatory in space will prove to be among the most significant scientific developments of the twentieth century.

The long-lifetime (15 years) planned for the HST, coupled with the need to make this premier instrument available to all astronomers as a National Facility raised the question of how it was to be managed and operated. Consequently, the National Aeronautics and Space Administration (NASA) asked the National Academy of Sciences to undertake a study of possible institutional arrangements for the scientific use of the HST. The study, undertaken by a Committee sponsored by the Space Science Board, issued a report (the Hornig report, Institutional Arrangements for the Space Telescope, National Academy of Sciences, Washington, D.C.) in 1976 that recommended that an institute be established "to provide the long-term guidance and support for the scientific effort, to provide a mechanism for engaging the participation of astronomers throughout the world,

and to provide a means for the dissemination and utilization of the data derived from the ST."

NASA subsequently contracted with the Association of Universities for Research in Astronomy (AURA) in February 1981 to form the Space Telescope Science Institute (ST/ScI). A site was selected at The Johns Hopkins University, Baltimore, Maryland, a building was erected, and the initial staffing is being completed.

In May 1984, NASA requested the Space Science Board to review the status of the ST/ScI with respect to

- Current goals and objectives,
- How well the needs of the astronomical community will be met by NASA's future plans,
- Whether the original goals and objectives need to be modified,
- The balance of efforts and resources provided to the community by the ST/ScI and by home institutions.

(The detailed Terms of Reference are given in Appendix A.)

The conclusions of the study are as follows:

1. The goals and objectives for the ST/ScI, as originally stated in the Hornig report, remain valid.
2. The ST/ScI must continue to attract and maintain a scientific staff of the highest quality. This requires a vigorous in-house program of scientific research.
3. The ST/ScI should optimize the HST science return within the available resources.
4. The ST/ScI must use advisory groups selected from the astronomical community in allocating time on the HST and support for observers in an open process that has the confidence of NASA, the Institute, and the community.
5. The ST/ScI has made valuable contributions in identifying tasks where the original plans were inadequate and has undertaken to perform some of these tasks. For the foreseeable future, the ST/ScI should limit its participation in new functions whenever possible to that of an advisory role.
6. NASA and the ST/ScI should continue to work in the spirit of cooperation and mutual respect. The AURA officers and Board should actively and continuously pursue this objective to maintain a productive relationship among NASA, the ST/ScI, and the astronomical community.

7. Immediate attention should be given to the preparation of a NASA/ST/ScI Joint Public Information Plan.

8. A clear statement of NASA's intent for the HST and the ST/ScI for the decade after launch is required as a basis for planning by the Institute and the community.

The numbered sections that follow respond to the four numbered charges to the Task Group (see Appendix A) as follows. Section II deals with charges 1 and 3, Section III deals with charges 2 and 4, Section IV deals with NASA- Institute relations, and Section V looks ahead to the transition to the operational state of HST.

II. REVIEW OF THE GOALS AND OBJECTIVES OF THE ST/ScI

The Task Group examined the current goals and objectives of the Institute as reviewed by the Institute itself (see Appendix A), by the Space Telescope Project at the Goddard Space Flight Center (see Appendix B), and by the astronomy community, as understood by the Task Group. The Task Group found not only consistency among the views of these three different communities but also general agreement with the original goals and objectives of the Hornig Committee as adjusted by NASA's response.

The general goals and objectives of the Institute are stated as number 4 of the Conclusions and Recommendations of the Hornig report:

> . . .to provide the long-term guidance and support for the scientific effort, to provide a mechanism for engaging the participation of astronomers throughout the world, and to provide a means for the dissemination and utilization of the data derived from ST.

More specifically to implement these general goals and objectives the following functions (agreed on by the three communities) are required:

- Solicit and select, through peer review, research proposals so as to make maximum use of the HST scientific potential.
- Plan and schedule HST science operations and issue observing instructions to the HST operations center.

. Monitor and maintain information on scientific and engineering performance data of the Science Instruments (and on HST where needed for science data interpretation).
. Maintain science instrument data calibration.
. Collect and calibrate observational data sets and distribute these to users.
. Assemble and develop the tools necessary for data analysis and distribute these to the users wherever possible (e.g., software).
. Maintain a HST data archive and promote its dissemination and use throughout the scientific community.
. Provide financial support to U.S. investigators using the HST for data reduction and analysis.
. Advise NASA on scientific issues relating to the HST, its operation, and its future development.
. Distribute information to the public on the scientific knowledge derived from the HST.

In order to perform these functions, it is essential that the Institute attract and maintain a scientific staff of the highest quality. It is, therefore, agreed that the Institute conduct a vigorous in-house program of scientific research focused largely on topics that utilize the scientific potential of HST. Only with such involvement will there be the necessary vested interest in the status of the instrument, the calibration of the instrument, and the integrity of the peer review process in which the staff will be involved as advisors and reviewers.

Neither the Hornig Committee nor NASA nor AURA correctly anticipated the magnitude of the effort that would be required to carry out these functions. The size of the effort, and the consequent growth of the Institute have raised concerns within the scientific community and within NASA. However, number 8 of the Conclusions and Recommendations of the Hornig committee report still appears to be fully valid. It reads:

> The Institute should be of sufficient size, in facilities and staff, to carry out its functions, but should not become so large as to absorb an inordinate fraction of the resources devoted to astronomical research. The Institute we envision would be comparable in budget and manpower to other national astronomical facilities.

Given the need for a reasonable size upper limit, the Task Group interprets the last sentence to mean to be within a factor of 2 of the ground-based national centers as they existed at the time of the Hornig committee report. The ST/ScI projected steady-state budget ($21 million in FY 1984 dollars per annum) is close to the upper limit of this range.

The Task Group recommends that the Institute optimize the HST science return within the available resources.

The Task Group also recommends that the Institute limit its participation in new functions arising in connection to HST to that of an advisory role, whenever possible. This has already been done with the data archiving system (DADS). The Institute plays a crucial advisory role but is not carrying out the actual construction task.

While emphasizing the commonality of the goals and objectives of the Institute among the different communities, it is clear to the Task Group that the accomplishment of these goals requires the existence of a harmonious, cooperative attitude between the partners in the HST venture. The Task Group is pleased to note the substantial recent improvement in this respect. The importance of cooperation and mutual respect between Institute and NASA cannot be overemphasized as a factor in the future success of the HST. The Task Group sees achieving and maintaining this relationship as the responsibility of the AURA and NASA management and recommends that both actively and continuously pursue this objective.

III. NEEDS OF THE ASTRONOMICAL COMMUNITY AND NASA'S PLANS FOR HST

This section addresses the question of how well the needs of the astronomical community are being met by NASA's plans for the Institute.

A. Institute Staffing

The Institute has made good progress toward building a staff that combines scientific stature with competence and willingness to work on problems facing the Institute. The scientific staff is one natural connection to the astronomical community. The network of links that is developing is essential to maximize the participation of astronomers, to help the Institute maintain a broad view of scientific developments, and to keep the community informed and participating (also see C and D below).

An important consideration in the development of the scientific staff is that the fields of interest be aligned with the areas where HST will be used. They can thus keep abreast of the detailed status of the instruments, be constantly alert to better uses of the available functions, and participate actively in the proposal review process as technical and scientific referees. In these ways, the benefits of a scientific staff at the Institute will accrue to the full range of users.

The constructive role that the scientists at the Institute can play is illustrated by the role they have assumed in maintaining the calibration data base. In this area, as in others, the Institute can represent the interest of the community and carry out tasks that are of utility to all users of HST.

The ability of the Institute to maintain an excellent scientific staff is dependent on a clear perception of NASA's intentions for stable, long-term support of the Institute. As the Institute moves toward maturity, the existence of a thoughtful and mutually acceptible long-range plan will be essential.

B. Data Analysis

Important interactions between users and the HST itself will be mediated by the Institute. Of special importance are the provision of information on the instruments to potential users, on the selection of proposals, on scheduling, and on data analysis. In the area of data analysis, the level of support provided to users can have a large impact on the Institute manpower and computer hardware requirements. As a minimum, removing the instrument signatures from HST images and spectra should be done by the Institute.

One means of reducing the demands on Institute resources is to provide a set of software tools for data analysis and to support the use of those analysis routines at the user's own home institution. The adoption of IRAF as the command language is a significant step in this direction. Since it is likely that IRAF will become a widely used standard in astronomy, many users will be familiar with it and a large body of software will be available within the community.

The key advantage of this distributed approach for users is that they can work on the data at home over a significant period of time rather than try to do all the analysis and thinking that HST data will demand during a brief, intensive visit in Baltimore. The advantage for the Institute is that the computing facilities and other support that visitors would require can be reduced by encouraging the use of facilities at the users' home institutions.

The entry of proposals, dissemination of scheduling information, and (especially) remote access to archives are all desirable aims for a computer network that the Institute could operate that would improve the utility of the Institute to users and reduce the burden on the Institute. These aspects were considered in the Hornig report, but the advance of technology has made their implementation much less costly than could have been anticipated 10 years ago. Software should be developed

and managed so that the codes (or at least the algorithms) can be implemented on a variety of machines.

C. Peer Review and General Observer Program

The balance between resources provided to the Institute itself and the resources passed through to the General Observers is a sensitive issue that must be handled with openness, frankness, and a regard for the possibility of conflict between the Institute's internal agenda and its role as guardian of the public trust. In particular, since the Institute will be the agent for allocating telescope time and observer support, and individuals at the Institute will be eligible for that time and support, every effort must be made to ensure that the review process has both the appearance and reality of fairness. The most constructive way to do this is to make the process as public as possible so that both the proposals coming in and the outcome of the allocations of time and money are known by all interested parties. While this may provide more feedback to the process than is comfortable, it does prevent abuse and build trust in this competitive and important allocation process.

D. Confidence Building

NASA's overall arrangements for the HST, including both the Guaranteed Time Observer (GTO) program and the observing program handled through the Institute, have created a perception that there are these two tracks to the use of the Space Telescope. The inside track includes the GTO's, while everyone else must compete for the remaining, heavily oversubscribed telescope time or for a role as an archival researcher. While this situation was not created by the Institute, replacing mistrust with confidence and envy with cooperation is essential. A good beginning has been made through the Institute Newsletter, the establishment of the Working Groups, and the workshops held at scientific meetings. These have engaged many active astronomers, with no previous contact with HST, in the process of shaping the scientific program. After launch, Users' groups with parallel functions can be used to maintain the community's confidence in the process.

E. Long-Term Intent

A clear statement of NASA's plan for HST and the Institute on a 10-year time scale would be helpful. In this way, the scientific programs, the staffing of the Institute, and the users research programs can be planned intelligently. Plans for refurbishment, replacement of instruments, and improvements to the telescope all have an impact on the scientific program. To avoid waste and poor use of the observing time or misplacing the strenuous effort of talented people, the operating level and duration of the HST and the Institute should be projected.

F. Second-Generation Instruments

Some past conflicts between NASA and the Institute have resulted from the difficulty of allocating resources to tasks that were not clearly anticipated in advance. To avoid relearning this lesson, it is essential to consider the impacts that the second generation of HST instruments will have on the Institute. Depending on the type of instrument chosen, the data-analysis tasks of the Institute may change. If the instrument has its primary use in a scientific area where the Institute has little staff, the Institute will have to adjust so that it can provide good service to the community. The calibration data that users will need should be available through the Institute. The Institute will be involved in making the second generation of HST instruments useful for astronomical research, and the impact of this on the Institute needs to be considered.

IV. RELATIONS WITH NASA

A. AURA-ST/ScI Role

It is inevitable when discussing large and expensive undertakings that the roles of the various elements be reviewed from time to time. The Task Group has reviewed the basic organizational relationships among NASA, AURA, and the Institute, and finds them to be reasonable in structure. However, unless all involved parties continue to strive for a cooperative, constructive mode of operation, even a sound relationship can flounder. It is critical that the AURA officers and Board become active in ensuring productive relationships.

B. Public Relations

The Hornig report acknowledged that one of the scientific functions of the Institute was to "inform the public." The specific words were:

> The publication of research results should be accomplished through the usual channels; however, the Institute should be a principal channel for disseminating information regarding the progress and operation of the ST and for communicating scientific knowledge derived from the ST to the public.

The only further mention of this important topic was under the heading of staff duties, where "a public information office" was to be included under "Administrative Services." The Task Group sees an urgent need for a joint NASA/Institute Public Information Plan. This plan should be structured to represent fairly the

interests of the four concerned parties: NASA, the Institute, the astronomical community, and the public whose support makes all of this possible. The plan must precisely delineate the public information responsibilities among the various parties, allowing for the responsibilities to shift among the parties as the project moves through its various phases.

The Task Group recommends immediate attention to the preparation of a Joint Public Information Plan.

V. THE FUTURE

A. The Maintenance and Refurbishment (M&R) Program

A reliable HST is vital to the science of astronomy as well as to the ST/ScI as an institution. The astronomical staff of the ST/ScI have staked their professional futures on the success of the HST. The Maintenance and Refurbishment (M&R) program is a key ingredient for ensuring the long-term performance of the HST. The production of a second Wide-Field Planetary Camera (WF/PC) is a positive step in the M&R program that recognizes the importance of the science to be done with a direct wide-field camera as well as the fact that much of the science of the other instruments depends on an operating WF/PC. The M&R effort must be balanced with the rest of the HST program. Mission operations, science operations, science data analysis, and the implementation of an archive all require an operating HST as a prerequisite, and it is the function of the M&R program to assure that the HST continues to operate with a high degree of reliability in the longer term.

B. The Transition to the Steady State

At the time of launch the activity at the Institute (and all other sites associated with the HST) will be fast paced. It is often assumed that, after launch, activities will settle down to a so-called "steady state." However, the steady state is not likely to be a placid time of routine operations. Rather, many activities, both routine and nonroutine, must be accommodated; many of them on a best-effort basis. For example, the Institute operations staff will attempt to optimize the science scheduling in order to maximize the

time on target with the HST. At the same time, they will cope with failures or degradations in the flight systems. The ground-system software must be maintained and, as appropriate, improved. Roughly 5 years after launch, it will be necessary to perform another survey of the southern sky in order that guide-star positions not become unreliable owing to proper motions. In the same time frame a new instrument may be installed in the HST, requiring changes to components of the ground-system software. There are likely to be so many things to do that not all can be accomplished with the available staff and budget at the Institute. Priorities will have to be assigned by the Institute in consultation with NASA and the user community. The Institute staff should remain focused on the science aspects of the HST, calling on the resources available through Goddard Space Flight Center or subcontractors in order to carry out tasks that are not directly related to the science of the HST.

C. Staff Professional Growth

The quality of service provided by the professional staff both to the Institute and to the astronomical community will depend not only on capability but also on the attitude of individuals as well. To retain a competent and enthusiastic staff, the Institute should provide reasonable opportunities for individual research and recognition for exemplary service. However, all too frequently rewards and recognition, such as sabbaticals, promotion, and tenure are based primarily on an individual's publication record, and many of the Institute staff, particularly those providing computational support, may find their responsibilities so demanding that little time is available for individual research or publications. The retention of a highly qualified, dedicated staff requires flexibility in establishing the criteria by which performance in a variety of individual duties is judged.

D. Archives

The most valuable long-term product of the HST and the Institute may well be the archival collection of data; however, the ultimate value of such a collection will be determined by its visibility, accessibility, and readability. According to the the Hornig committee report:

> The Institute should establish and maintain a library of all preprocessed data and all output of standard production processing. In addition, results of individual research programs appropriate to archival storage should be catalogued and placed in the library for general access by the community.
>
> An archive for [HST] data should be provided, including machine accessible image data, relevant astronomical data, support information on telescope position and temperature, calibration data, and relevant engineering data. In addition, film and plate storage should be accommodated.

It is essential that the Institute provide those resources necessary to support an archival system that is readily accessible to the professional community and that maintains its data base in interpretable, machine-readable form.

APPENDIX A

TERMS OF REFERENCE
OF
CSAA TASK GROUP ON
THE SCOPE OF THE SPACE TELESCOPE SCIENCE INSTITUTE

BACKGROUND

NASA is committed to the establishment and support of the Space Telescope Science Institute (ST/ScI) for the definition and administration of the research program to be carried out with the Hubble Space Telescope (HST). The original scope and objectives of the ST/ScI have been derived from the recommendations of the Hornig Committee and from NASA's response to them. NASA subsequently conducted a competition resulting in the selection of AURA as the contractor to organize the ST/ScI on the campus of the Johns Hopkins University, to develop a capability for science operations with the HST, and to conduct the science program. Substantial progress has been made to date in establishing and staffing the facility and in developing an operational capability.

The complexity of ST operations was not fully recognized either by AURA or by NASA at the outset. Some increases have already occurred and more may be required both in the amount of staff and equipment necessary to carry out the several functions of the ST/ScI. It is apparent that implementation of the ST/ScI goals to the fullest degree desirable is a larger task, requiring greater resources than was originally contemplated. Under these circumstances, it is necessary to examine what has been achieved so far and to consider ways to provide the necessary services to the astronomical community in a constrained budget.

CHARGE

1. Review the current goals and objectives of the ST/ScI in the light of the original expectations outlined in the recommendations of the Hornig Committee and NASA's response.

2. Examine how well the currently perceived needs of the astronomical community will be met by NASA's plans for future development of the ST/ScI.

3. Consider to what extent, if any, the original goals and objectives should be modified to meet current scientific needs. The panel should suggest what should be the scope of the ST/ScI needed to meet the basic scientific requirements outlined above.

4. This should take into consideration the appropriate balance of efforts and resources to be provided to the community by the ST/ScI and to be provided by the community in their home institute.

The purpose of this exercise is not to revisit fundamental decisions previously made, such as whether or not there should be an "independent" ST/ScI, or whether development of later generations of ST instruments should be the responsibility of the ST/ScI or of NASA. The panel's recommendations will be used by NASA and the ST/ScI in determining ways to implement the service and research functions assigned to the ST/ScI and to judge whether the resulting capabilities meet the scientific requirements.

APPENDIX B

GOALS AND OBJECTIVES FOR THE SPACE TELESCOPE SCIENCE INSTITUTE--INSTITUTE VIEWS

The basic goals of ST/ScI have not changed since they were delineated by the Hornig Committee and refined by NASA Task Group (Keller Committee). We believe that there has been a significant improvement in understanding by both NASA and AURA of the means by which to achieve them.

The fundamental goal of ST/ScI is to optimize the scientific program of ST through solicitation and selection of the most significant research projects from astronomers in the U.S. and elsewhere in the world and through dissemination of data and support for effective utilization of data so obtained. This fundamental goal is to be pursued through a variety of means including:

- The establishment of an effective process for peer review of ST observing proposals.
- The establishment of tools and procedures for effective planning and scheduling of ST science operations and efficient execution of same.
- Provision of tools and information for scientific utilization of ST data. It is the intent of ST/ScI to distribute the software in this category for use at an investigator's home institution, as well as at ST/ScI.
- The accumulation and utilization of information concerning Science Instrument (SI) performance, including interpretation of engineering data from SI's, SI calibration and telescope calibration. This activity is, in a sense, the consolidation and preservation of the knowledge gained by the

instrument teams and telescope contractor while creating ST.

- The disbursement of research funds to those U.S. investigators requiring them for reduction and analysis of ST data. On occasion this program will also fund observations or other activities in preparation for ST observing.

ST/ScI also has an important role to play in advising NASA regarding maintenance and refurbishment of existing SI's and the selection of new generations of SI's to replace the existing complement. As the planner and evaluator of the science program for ST the ST/ScI is in a uniquely advantageous position to perform this function and in so doing to have a significant influence on the quality of future science to be done with ST.

In order to perform the above functions it is essential that ST/ScI create and maintain an in-house astronomical research program of the first rank. Such a program is necessary to attract and retain a scientific staff of the highest quality and to guarantee that its members retain their interest, currency of understanding, vision for astronomical research and the potential of ST.

ST/ScI will also support NASA's public information program for ST. As the location of the scientific data and as the contact point between NASA and the scientific user of ST, it is expected that a significant fraction of press attention to ST will focus on ST/ScI.

There does not appear to be any need to revise these goals to meet current scientific needs.

Relation of these Goals to Current Plans

As a result of the planning and budget discussions between ST/ScI and STP-G during the summer and fall of 1984 it appears that a plan is being developed that will provide reasonably well for the routine science operations. While there are still some areas where additional resources may be needed at ST/ScI, e.g., technical support for data reduction by General Observers may have to be increased, the mechanism for assessing these needs and responding to them is adequate. In addition, requirements for adjustments in operational support levels may become evident after the operational systems are delivered and some experience in their use is

obtained. NASA has already responded to the urgent need for additional computational capability at ST/ScI.

The ability of ST/ScI to preserve and utilize the information on instrument performance and to advise NASA on instrumental matters is probably limited by the staff devoted to this function in the present plans. ST/ScI is initiating discussions with STP-G aimed at developing a mutual understanding of the needs in this area. The policies and procedures for advising NASA on maintenance and refurbishment and on new instruments for ST are being developed in a satisfactory manner.

It is clear that ST/ScI cannot become the sole provider of data reduction and analysis capability for ST data; many observers will take ST data and probably some ST/ScI-furnished software to their home institutions. To further this, both NASA and ST/ScI have demonstrated an interest in establishing an automated Data Archive and Distribution System and utilizing a communications network to provide access to the ST data from sites remote from Baltimore. While, for budgetary reasons, the progress in these areas may be slower than ST/ScI might wish, the general value and concepts seem to be shared between NASA and ST/ScI.

NASA has proven generally supportive of the creation of the research program within ST/ScI. To the extent that ST/ScI has been slower than desired in reaching its potential in this area, the reason has been the impact of programmatic work on the time of the staff scientists. These individuals themselves have often tended to place a higher priority on the programmatic tasks and to sacrifice their research time; this is essentially an internal problem of ST/ScI.

The public affairs plan for ST is currently being developed by NASA with the participation of ST/ScI, GSFC, MSFC, and Headquarters personnel. It appears that this process will converge to a plan for ST activities that is sufficient and realistic in light of NASA's budgetary realities.

APPENDIX C

GOALS AND OBJECTIVES FOR THE SPACE TELESCOPE SCIENCE INSTITUTE--GODDARD VIEWS

The goals and objectives of the Space Telescope Science Institute (ST/ScI) have generally remained consistent with the recommendations of the Hornig Committee. In short, they are to implement a science program for the Hubble Space Telescope (HST) in a manner that will achieve the scientific goals of the Project and will be responsive to the needs of the astronomical community. The immediate objectives are to develop the capabilities which are necessary in order to carry out the following responsibilities:

- Solicit and select research proposals in ways that will promote the scientific productivity of the HST
- Plan science observations and issue command requests to implement these observations
- Monitor scientific and engineering performance and maintain instrumental calibrations
- Collect and calibrate observational data sets and distribute them to observers
- Collect and maintain data analysis routines to be used by scientists both at the ST/ScI and at their home institutions
- Archive HST data and promote its dissemination and use throughout the scientific community, subject to NASA policies regarding proprietary rights
- Distribute information to the public regarding the HST
- Advise NASA on the utilization, maintenance, and modernization of the HST
- Provide financial support to HST observers in accordance with NASA policies

. Conduct a vigorous "in-house" program of astronomical research

These responsibilities assigned to the ST/ScI have not been in dispute since they were originally adopted and we would not advocate changing them now. However, neither the Hornig Committee nor NASA nor AURA correctly anticipated the magnitude of the effort that would be required, both in dollars and in manpower, in order to carry them out. Consequently, there has been a continuing necessity to justify rigorously every capability and service that will be provided. There is also a continuing strong pressure to provide these capabilities at the minimum possible cost during both development and sustaining operations.

The result of these pressures will be to develop the ST/ScI in a way that embodies only features that are most important to the long-term goals of the HST, to provide these features in an economical style, and to agree that some features may not be available at the beginning of research observations, but will be added as time and funding permit. We believe that this can be done without sacrificing the needs of the astronomical community for a modern, general purpose research facility. In recent months Goddard Space Flight Center and the Association of Universities for Research in Astronomy have been engaged in constructive discussions to define a viable program that can be achieved within a realistic budget. Although this process is not complete, substantial progress has been made and we believe that it will be successful. Equally important, the two organizations have established avenues of communications that will make it easier to work future problems as they arise.