

Report of the Hubble Space Telescope Users Committee

October 18 & 19, 2007

Members present: Martin Barstow, Peter Garnevich, James Green, Jean-Paul Kneib, David Koo, Patrick McCarthy, Robert O'Connell, Tommaso Treu, Marianne Vestergaard

Absent: Mario Mateo, Phillip Nicholson, and Abhijit Saha

Executive Summary

The Hubble users committee is pleased to report that while the observatory is presently operating in a state of less than optimal capability, the prospects for restoring, and enhancing, Hubble's power are excellent. The committee is very satisfied with progress towards servicing mission 4 and believes that NASA has established a good set of priorities. We are encouraged by the continued progress with WFC3, the readiness of COS, and the effort being devoted to repair STIS and ACS. The STUC has some concerns regarding the staffing level at the Institute in anticipation of a successful servicing mission, but is pleased with the current distribution of effort between operating instruments, support for the archive, and development of software tools and documentation for the new instruments. We look forward to continued success from the observatory as the Project and Institute carry us into the next five years of Hubble operations.

Top Level Recommendations and Observations:

- The STUC commends the project and the Institute on their progress towards SM4. We are particularly pleased to see that the mission plan aims to leave Hubble with five fully functioning instruments while addressing vital health and safety issues.
- The user's committee continues to be concerned about staffing levels at the Institute in light of the heavy workload anticipated after the servicing mission. We encourage NASA to think of SM4 as the beginning of a new era of scientific opportunity that will require sustained support and investment if we are to reap the full potential of the revitalized Hubble.
- We recommend that the cycle 17 call for proposals instruct guest observers requesting ACS prime observations to address how their programs would be impacted by a transfer to WFC3 in the event ACS is not available. This could be included in the technical justification section of the proposal form. We encourage the TAC to take this information into consideration in ranking proposals and making their recommendations.
- We encourage the Institute to engage the community in discussions regarding the implementation of multi-cycle treasury programs at the earliest possible date, should a decision be taken to start such a program. The community can provide valuable input into regarding issues including: a ceiling to the fraction of the GO

pool allocated to this class of program, data rights policies, support for archival research etc. The STUC believes that these programs should not adversely impact the small and medium sized proposals. We encourage the Institute to structure the review process for such proposals in a way that allows proper comparison of the scientific return of programs spanning the full range of sizes. These steps will help ensure a balance in the program and retain the scientific opportunities enabled by small and medium programs.

- We suggest that cycle 16 NICMOS camera 3 guest observers whose programs are not implemented by the time of SM4 be advised that they can request a transfer to WFC3 via the standard program change request mechanism.
- The STUC encourages the institute to pursue the idea of a two-day workshop to assist with development of phase-II programs for cycle 17.
- The STUC is pleased to see that the Institute is exploring ways to make the survey proposal category effective.
- The users would welcome a senior review of Hubble as we are convinced that it remains NASA's premier astrophysics mission.
- We commend the Institute on its training program for staff supporting new and repaired instruments.
- We support the Institute's goals for a successful pure parallel program for cycle 17 and beyond. We encourage the Director to instruct the TAC members to consider the balance between pure and coordinated parallels when reviewing requests for coordinated parallels.
- The STUC was impressed with the development of the HLA software tools and look forward to continuing progress. The long-term value of archival data and interrogation tools is evident, but investment in these areas should be weighed against priorities for acquiring new data and supporting active instruments.
- The committee is pleased to hear about the extensions to the MOUs between NASA and ESA for continued European participation in Hubble and between ESA and ESO for continued support for the ECF. We encourage NASA to continue to work to extend these cooperative agreements beyond 2010. ESA and the ECF bring added scientific value to the Hubble users community.
- We were pleased to hear that COS continues to be ready for deployment and that ground system tests are going smoothly. The COS GTO science program continues to be exciting and current despite the hiatus since its inception.
- The STUC was happy to hear of the progress in securing state of the art near-IR detectors for WFC3 and the successful testing of the basic instrument functions in

the thermal-vacuum chamber. We thank the IPT for their dedicated effort in carrying out the demanding schedule of tests and integration activities needed to bring the instrument to its current state and we look forward to seeing the instrument deployed during SM4.

Minutes of the Meeting

STScI Outlook: Mountain presented a positive perspective on the recent developments, particularly regarding the service mission activity, without hiding the challenges that the Institute will face in the near future. He stressed that Hubble is still producing very high-level science, and still captivating the public at large. He highlighted two recent key science results. The first was the measurement of the stellar mass of "building blocks" galaxies at $z \sim 5$ which are found to be the least massive high redshift galaxies observed to date (this result was possible by combining Hubble and Spitzer observation). The second, recent observations of the rings of Uranus, in which the rings are seen edge-on allowing detection of scattered light around the ring and aiding searches for new satellites. New Hubble Heritage images of planetary nebulae with WFPC2 have gotten a fair amount of press coverage. He underlined the involvement of the Institute in providing spectacular images for the already popular GOOGLE Sky, launched August 22, 2007.

Mountain reviewed NASA's priorities for SM4, now planned for launch on August 7, 2008. These are: installation of RSUs, WFPC3 and COS, and new batteries, a refurbished FGS, repair of STIS and ACS, and installation of new outer blanket layers (NOBLs). These will be addressed in the five planned EVAs. He reviewed the Hubble budget and staffing at the Institute, which has suffered a significant reduction over the last few years. Because of the foreseen increase of activities due to SM4, Mountain recognized that the priorities for the staff activity and the Hubble instrumentation effort would likely have to be modified.

Mountain discussed the possibility of having multi-cycle treasury programs after cycle 17. One of the motivations is to get the best science out of the last years of the Hubble mission. White papers have been solicited to the community, and if excellent ideas are expressed, Mountain indicated that he would be happy to leverage the best projects with director's discretionary time. Finally, Mountain discussed possible lunar science to be conducted with Hubble. Although observations of the moon with Hubble present some significant challenges, high-resolution UV imaging of the lunar surface may enable new discovery. In this respect, a white paper call will be issued, and Mountain may allocate ~ 30 DD orbits to conduct the best science. NASA SMD will cover the additional cost that may arise for these unusual and difficult observations.

HST status: Sembach reported on the current status of HST, including the recent gyro failure, a NICMOS safing event, plans for completing Cycle 16, status of individual instruments and staffing levels. HST entered safe mode at 7:00pm EDT 31/08/07 due to a failure in one of the gyros. The cause was believed to be a flex lead failure, the most common failure mode. Only 3 gyros remain operable; one remains switched off and HST continues to operate in the 2-Gyro mode. There is a good probability (65%) of reaching

SM4 with 2 functioning gyros. A 1-gyro mode is in an advanced stage of preparation, with on-orbit testing planned for the week beginning Jan 28th 2008. There was a NICMOS safing event on September 9 due to a single event interrupt. The instrument was recovered with nominal parameters, but some adjustments to temperatures were needed. Science operations resumed on September 9.

The Cycle 16 long-range plan was reviewed. Following SM4, remaining WFPC2 observations will be transferred to WFC3. Programs that are more than 90% complete will not automatically be transferred to WFC3, but the PI will have the opportunity to provide a justification for transfer. Programs that are 10-90% complete these will be moved forward if possible.

Important cycle 17 dates include: the CP release date, Dec 3rd 2007, and the Phase 1 proposal deadline, March 7th 2008. The TAC panel will meet from May 12-16 2008. The phase II deadline is set for July 3rd 2008. It is expected that the first science observations will take place ~4-6 weeks after SM4. Cycle 17 will run until Dec 31st 2009.

A new organizational structure was put in place for HST instrument teams in April 2007. The COS and STIS groups have been combined into a single team, as have the ACS and WFPC2 teams. These groupings seem to be functioning well and individual technical leads for particular instruments remain within the teams. SMOV activities for SM4 have been defined, instrument handbooks are being prepared and ETC development and testing is underway. First drafts of the COS and WFC3 handbooks have been completed.

All STIS data have been reprocessed (~120,000 data sets) and on the fly reprocessing in the archive will be discontinued for these. However, limited improvements may be implemented later and the OTFR will be operational for new observations post-SM4. Flight hardware for STIS repair is complete and undergoing functional and environmental testing. The proposed STIS cooling system has been dropped from SM4 due to the modest expected benefit, particularly when COS is available. This was a long task and removing it from the plan takes pressure off the EVA time.

The ACS repair plan aims to restore wide field channel functionality using the side-1 electronics. A secondary goal is to restore the HRC functionality as well. The ACS repair team just completed a critical design review. Flight hardware will be ready in ~March 2008 and thermal vacuum testing will follow in time to meet the launch schedule. The current mission schedule shows the ACS repair work split between two EVAs. The work breakdown between the two ACS-related EVAs is still being reviewed with a goal of getting the repair into a single EVA. A new CCD optimization program will be included in cycle 17, with the aim of reducing noise on the WFC CCDs and will be executed promptly if noise measured during SM4 functional test is not satisfactory.

WFPC2 is performing well and operating nominally. A reduced temperature on the replacement heater is being used to mitigate effects of the bias anomaly in WF4 and a new CTE correction formula has been implemented. Closeout plans have been defined and calibration has been improved to support final WFPC2 reprocessing.

NICMOS is currently the major science instrument for cycles 15/16 and efforts are being expanded to characterize the instrument. This will include some special legacy calibration programs on spectrophotometric standards and improved grism calibrations. FGS3 is degrading and, as a mitigation effort, guide star selections are being biased to avoid using this unit when possible.

There will likely be increased pressure on the staffing resulting from the need to support five working instruments post SM4. Staff levels are substantially reduced in numbers compared to previous servicing missions; major areas with fewer FTEs are software maintenance, operations, and engineering. Instrument support will be staffed at a lower level than in the past, particularly in the short term. Staffing in these areas is expected to rise from the current level of 38 FTEs to approximately 46.5 FTEs by August 2008, following the subcontracting of some work to JHU, recruitment of new staff (including fixed term appointments and data analysts), and the transfer of several ESA positions from other areas within STScI. The balance of instrument support will likely be adjusted following the cycle 17 program selection.

A Lunar observing initiative has been announced and being reviewed through a white paper process. There will be a time allocation process separate from the normal TAC, as this program will be supported by Director's Discretionary time. A call for proposals will be issued September 2008 with a 15th Nov deadline. Proposals will be reviewed in January 2009 and implemented during cycle 18.

Parallel Observing Post-SM4: Sembach reported on the Institute's planning for parallel observations after SM4. Coordinated parallels will continue to be supported and the institute will encourage these. The institute desires to support pure parallel science but would like to limit the scope, both to ensure a successful program and to control the workload. They propose to implement pure parallels through TAC allocations in the same process, and with the same standards, as other observing programs. Sembach believes that allowing greater interaction between the pure parallel PIs and the prime observing programs can enhance the return on pure parallels. In particular the institute plans to provide a list of available parallel opportunities to the pure parallel teams after the prime phase II submission are complete. The pure parallel programs would then identify which visits they would like to attach parallels to, subject to the prioritization between pure parallel programs determined by the TAC. The Institute may impose ORIENT constraints on the primes if these enhance the parallel science with no negative impact on the primes. They propose to limit pure parallels to ACS and WFC3 and to allow them only when COS is the prime instrument and when the COS readouts will not be impacted. The parallel use of more than one instrument, or more than one channel of ACS, will be allowed, but multiple parallel programs will not be allowed to attach to a single prime visit. It is expected that COS will capture ~25% of the available observing time and so roughly 700-800 orbits should be available for pure parallel programs. The default proprietary period for pure parallels will be 12 months, as it is for prime programs.

Cycle 17 Update: Reid reported that the Cycle 17 Call for Proposals will be released 12/3/07 with a deadline of 3/7/2008. The TAC will meet at STScI and JHU starting 5/12/2008. The Phase II deadline will be 7/3/2008, just a month before the scheduled SM4 launch date of 8/7/2008. Because of HST's enhanced capabilities and the duration of Cycle 17, roughly 1200 proposals are anticipated. The Solar System review panel in the current system will be replaced by two panels covering the solar system, exoplanets, circumstellar material and star formation. Owing to the increased load, each proposal will be read by only 2/3 of the members of each panel, rather than all members as in the past. The triage cut will be raised to about the 40th percentile, but each panel will be asked to rank proposals amounting to about twice the number of available orbits.

Contingency policies are being developed to address the possible failure of the STIS or ACS repairs. The Institute proposed that program that request ACS, as the primary instrument will be voided if the ACS repair is not successful. The STUC discussed this issue at some length and suggested that PIs should have the opportunity to explain whether a transfer to WFC3 could meet their scientific goals. This discussion should be included in the technical justification section and limited in length, to half a page, for example. Reid believes that if this option is allowed, then a similar option should enable STIS users to justify transfer to COS.

Because the SM4 launch date has been moved forward, a significant number of Cycle 16 programs will not be completed before launch. Most of these will be rescheduled and executed after SM4. Incomplete WFPC2 programs will be shifted to WFC3. There was an extensive discussion of the status of NICMOS proposals post SM4 and there were differing opinions between the majority of the STUC and the Institute. It was noted that observers using NIC3 in particular might accrue significant advantages by switching to WFC3/IR, while most NIC2 users probably need the finer scale or the coronagraph. It was agreed that any PI can request a change in program and that this provides a mechanism for NIC3 programs to be moved to WFC3. The STUC encourages the Institute to make PIs aware of this option, as we believe that the scientific return of the observations may be enhanced.

The new "survey" class of proposal is being offered again for Cycle 17. No survey programs were approved in cycle 16 and the Institute is considering increasing the subsidy to the panels for these programs to improve their chances of success. The STUC endorsed this approach and would like to see this program get a fair chance in cycle 17 and then reevaluated as needed.

Details on the WFC3 Early Release Science programs, intended to provide a thorough test of the new camera's special capabilities, will be made available to Cycle 17 proposers via a Web site. GO/AR proposals can base complementary or supplementary programs on these data.

STScI is exploring the scientific potential for very large, multi-cycle Treasury

programs during the 5-year period following SM4. A call for white papers for such projects (>400 orbits) has gone out, and these will be assessed with a recommendation to the Director by mid-January 2008. The current plan is that proposal for this type of program, if solicited, would be evaluated by a separate TAC and first implemented for Cycle 18. Mountain expects to supplement orbits from the GO pool with additional orbits from his discretionary time. STUC discussed the likely impacts of such large programs at some length and recommended that the Institute engage the community in discussions regarding the implementation of this program as soon as possible, if a decision is made to proceed.

STScI is helping to invigorate interest in lunar science in several ways. The Cycle 17 CFP will alert the community to the potential of lunar observations. A modest number of DD orbits have been allocated to the SM4 shuttle astronauts for lunar science. HST observations in support of the LCROSS lunar impact experiment (January 2009) will also be scheduled. Finally, STScI plans an initiative in exploratory lunar science involving about 30 orbits of Director's Discretionary time during Cycle 18 based on white paper submissions early in 2008. Although relatively few orbits are now planned for lunar observations, resource impacts on the project are significant because of the difficulty of tracking such a rapidly moving target.

COS Status: Aloisi reported that the COS instrument appears to be in good shape with only minor problems uncovered during tests of the ground system. The on-orbit verification plan is being developed and reviewed and is progressing well. The present SMOV plan runs into November 08, longer than that planned for the other instruments and this could impact ERO and ERS programs. There were suggestions that there may be ways to shorten the SMOV process.

Two of the NUV gratings in COS continue to show degradation in their efficiency. The exact cause is not certain but is believed to be related to corrosion of the aluminum coatings. If present trends continue until launch, the sensitivity at the longest wavelengths will be down by ~25% from the original value. The project decided some months ago, with the concurrence of the IDT, against opening the instrument to address this issue and the STUC concurred with that decision.

COS GTO Science Program: Green gave a brief overview of the COS teams science program. Their science covers a wide range of topics from large-scale structure to the Solar system, but the core science remains the study of the IGM at low and intermediate redshifts. There are a number of new targets since the loss of STIS and some targets previously observed with STIS, or GHRS, will be repeated with COS to produce significantly better data. The STUC was impressed with the GTO science program and looks forward to seeing the results post SM4.

HLA Update: Whitmore reported on recent progress within the Hubble Legacy Archive program. The goal of the HLA is to secure an enhanced science return from data obtained

with HST on long time scales. This will be aided by providing enhanced Hubble products and advanced browsing capabilities. The HLA make use of recent advances in computing power, web-based tools and the maturing content of the archive. It should ultimately increase overall HST-enabled science by making it easier to browse and download HST data, reduce redundancy, and connect to the VO.

Whitmore demonstrated in real time some of the features of the HLA interface, particularly the "footprints", "images" and "inventory" views, together with the interactive display. The first HLA data release occurred on July 31, 2007 and is available at <http://hla.stsci.edu/>. Currently it holds about 25% of ACS level 2 images (combined within a visit), some NICMOS GRISM extraction (from ST-ECF) and some object catalogues. A PASP paper is in preparation describing data processing and data quality issues. The first HLA regular data release is planned for January 2008. This will contain more science products and imaging data for about 90% of the ACS data. New science products such as spectroscopy prototypes, WFC2 chip combination, ACS mosaics and contributed products (such as GOODS) will be implemented.

HLA is a coordinated effort between STScI, the ECF, and the CADC following an agreement signed in June 2007 by the HLA Board. The Board is the guardian of the "HLA brand" and will meet when data products and services are ready for release and coordinate an assessment procedure to determine whether an adequate standard is reached. The HLA board members are: Ken Carpenter, Richard Hook, Mario Mateo (STUC), Warren Miller, David Schade and Brad Whitmore.

HLA work was funded in FY07 via a technical directive from the Hubble Project. Funding for FY08 has been approved, funding levels for FY09 and beyond will be subject of new negotiations with the project. The team involves 10 people at STScI, 5 at the ECF and 2 at the CADC, most of these people do not work full time on the HLA.

The STUC is happy to see that the HLA team has met its target date for early data release, and is very pleased to see the progress made. We look forward to the upcoming data release in January 2008, as this will help users prepare for their cycle17 proposals.

ECF Update: Kummel reported on recent activities at the ECF relating to the HLA and WFC3. They have been focusing on software for HST spectroscopy and the slitless grisms in particular. They have processed most of the NICMOS grism data to the point of extracting calibrated 1-D spectra and these are being integrated into the HLA. They have processed the thermal vacuum data for the WFC3 grisms. The two IR grisms look very good now that the problems associated with the first installation of the G141 have been resolved. The throughput values are high and very uniform. The wavelength solutions are well determined and are quite linear.

ESA Update: Macchetto reported that an MOU between NASA and ESA has been signed that extends the cooperative agreement until the end of 2010. He believes that there are good prospects for the agreement being extended further, with the level of commitment being dependent on the results of SM4. A separate cooperative agreement is

being concluded for support for JWST. With regard to the ECF, the new leadership at ESO appears to be interested in maintaining its presence beyond 2010. The STUC was pleased to see this progress and encourages NASA to continue to pursue closer cooperation with ESA and continued support for the work at the ECF.

Bologna Meeting: Nota gave a brief report on the plans for the January 2008 meeting in Bologna relating to HST science post SM4. The purpose of the meeting is to inform the European community of the scientific opportunities enabled by the new instruments and the expected repair of STIS and ACS. A number of speakers from the COS and WFC3 teams will be present. Nota encouraged the STUC members to attend and to encourage their colleagues to participate. The STUC believes that this will be an interesting and informative meeting and wishes the organizers the best success.

ERO Plans: Noll noted that a fair number of people, at a variety of levels, are involved in the process of deciding what should be observed as part of the early release observations for SM4. All five instruments will have EROs. The general philosophy is to produce the maximum positive news for the Hubble project. A secondary goal is to communicate the excitement of astronomy to the public. The process involves four phases – brainstorming, winnowing of the target list, briefing HQ, selecting final targets, and finally implementation. It appears that this process is on track.

Headquarters Perspective: Hayes reported that the SMD budget would see 1% growth (pre-inflation) after FY07 and 2.4% growth from 2012 to 2013. The science division goal is to manage programs within budget and schedule; adjustments may need to be made when science priorities change. New missions in the next 18-24 months include GLAST, HST-SM4, Kepler, Herschel/Plank and WISE. There is a new focus within SMD on R&A and data analysis. They have reinstated NuStar and are looking at the next SMEX AO. Strategic mission concept studies are due in November. The Beyond Einstein Program Assessment Committee (BEPAC) has stated that JDEM should be the top priority, followed by LISA; the status of CONEX is unclear at this time.

There was an extensive discussion of NASA priorities in the coming years and their relations to the HST project. The STUC thanked Hayes for his insight into the thinking in Washington and for articulating the challenges that Hubble faces in an environment of flat budgets and rising scientific expectations.

Status of the Project and HST Program: Burch reported on the status of the observatory and plans for SM4. He described the rationale for the prioritization of tasks along with the detailed status of training and other preparations for the servicing mission. He noted that WFC3 would be installed on the first EVA day along with the batteries. The second EVA would focus on gyros and batteries. COS would be installed on the third EVA, STIS repair on the fourth day. ACS repair work is spread over EVA's 4 and 5. The EVA timeline presented is currently optimized in light of both mission priorities and the practicalities of fitting the work into the available time on each day. In the current plan only the most critical thermal blanket replacement will be carried out, and these occur on the last EVA day. The other two have been dropped from the manifest. It might be

possible to reinstate the thermal blanket replacement as a parallel task. It is expected that the projected ACS repair time will be reduced, with the goal of fitting it into a single EVA.

Burch present several shortened mission scenarios, but noted that these were still under development. If only one day is available, the priority would be the WFC3 installation and as many RSUs as could be installed. With only two days available, COS and one battery module would be included. With 3 or 4 days available, two schedules have been prepared with STIS and ACS repairs as alternatives, the choice of which will depend on the results of training and development of the various repair programs. He emphasized that contingency planning was still actively being worked and thus these plans are provisional.

The possibility of a near-term gyro failure was discussed. One gyro (#6) is relatively young, but gyros #1 (ON) and #4 (OFF) are both near their 50% failure run-time levels. Therefore, Burch believes that there is a strong possibility that 1 gyro mode may need to be implemented before SM4.

Burch summarized the status of the SM4 flight hardware. COS is in good shape; WFC3 has some detector issues, but IR thermal instability and throughput issues have been resolved. The UVIS-2 and IR-1 detectors are installed, but work is going on to solve a glinting problem in UVIS-1. There is other work to be carried out relating detectors and replacing calibration lamps. STIS repair work is on track and considerable progress has been made in developing the ACS repair plan, based in part on the STIS experience. Tests indicate that it may be possible to restore the HRC by back-powering it through the flight power harness, but this depends on the actual condition of the on-orbit hardware, which are not fully understood.

Leckrone reviewed the SM4 manifest and priorities, and noted that these were developed with input from a number of sources, including the STUC. The guiding principle from the Institute and Project perspective was the desire to maximize the scientific productivity of the observatory for a period of five years. NASA SMD included other priorities in the final determination of the timeline, including crew training and optimizing efficiency on orbit. Headquarters has defined a set of core priorities that include installation of RSUs, WFC3, COS, batteries and a refurbished FGS. Supplemental mission priorities include repairs to STIS and ACS, and installation of NOBLS 8, 5 and 7. Leckrone believes that this is a very positive outcome as all of the items desired by the project and the user community are on the manifest. The STUC agreed with this sentiment and is pleased that all of the key components needed to return HST to full operation and at the APEX of its capabilities are part of the baseline plan.

Leckrone reviewed the status of the long wavelength gratings on COS. Although it was expected that oxidation of aluminum-coated gratings should eventually stabilize as an oxide layer forms, the efficiency in the COS NUV gratings continues to drop. They currently meet the formal specification, and the main issue is their on-orbit performance in the long term. Similar degradation is seen in the flight-spare gratings. The current best

theory is that continued oxide growth is producing the degradation and that this should cease in orbit.

Large variations were reported in the WFC3 IR channel throughput, but with no particular trend. The problem was eventually traced to uncontrolled systematic effects in coupling the IR light source to the instrument. More reliable procedures will be developed for the next thermal vacuum test. Two internal flat-field lamps have failed and the other two have degraded performance, all four will be replaced.

The WFC3 flight spare IR detector is currently in storage at GSFC while the flight unit will be delivered ahead of schedule. UVIS-1 has had problems with cracking of the thermo-electric cooler. There are also problems with conducting gold particulate debris shorting the flex leads. Although UVIS-2 is working well there are concerns that there might be hidden damage to the TEC that might not survive launch.

NASA HQ will play a more direct role on defining the ERO program and has taken the view that this should be more extensive than on previous missions. The project would demonstrate the power of the new capabilities to the scientific community, particularly in advance of a senior review in 2010.

WFC3 Report: Mackenty presented a detailed summary of the status of WFC3. Thermal Vacuum Test 2 was exceptionally long and intensive, but did resolve and validate a large number of outstanding issues. The basic functionality of the instrument has been demonstrated and a good start has been made on some of the essential calibrations. The project now has two infrared flight detectors with excellent science performance, as well as two spares. The UV-visible flight detector has excellent science performance, but there are issues with the thermal electric coolers and the flex leads. We were pleased to learn that the anomaly with the IR channel throughput appears to have been traced to instabilities in the test equipment. STUC commends the institute and its WFC3 team for its extra dedication and hard work needed to resolve the WFC3 detector issues and provide the community with the best possible instrument under a challenging schedule with limited resources.