

Report of the Space Telescope Users' Committee (STUC) Meeting, 4-5 April 2005

The Space Telescope Users Committee (STUC) met on April 4th and 5th 2005 at the Space Telescope Science Institute (STScI) and the Goddard Space Flight Center (GSFC)

Attended: David Axon, Martin Barstow, Martin Elvis (Chair), Eric Emsellem, Laura Ferrarese, Pat McCarthy, C. Robert O'Dell, Regina Schulte-Ladbeck.

Unable to attend: Monica Tosi, Donald G. York

The STUC welcomed reports on the state of the Hubble Space Telescope (HST) and the Institute from the STScI Director, Steven Beckwith; NASA GSFC Center Director, Ed Weiler; NASA HST Project Scientist, Dave Leckrone, Assistant Project Scientist, Malcolm Niedner; NASA HAS Program Manager, Preston Burch; STScI HST Mission Office Head, Rodger Doxsey; STScI Science Policies HEAD, Duccio Macchetto; STScI staff scientists Gerry Kriss, John Mackenty, and Keith Noll.

1. Institute Outlook [Steve Beckwith]

The STUC is pleased at the continued pace of HST discoveries as reflected in the Science News metric and the output of refereed papers.

The STUC welcomes Jim Manning as the new head of the Office of Public Outreach.

HST future is uncertain at this time. While the NAS/Lanzerotti report recommended that Hubble be serviced by the shuttle, concerns were expressed about the viability of a robotic mission. Perhaps as a consequence, NASA has officially canceled plans for robotic servicing. The new proposed NASA's budget includes no servicing on any kind for HST, in fact no funding provision is currently made for a de-orbiting mission, which must be carried out to allow HST to re-enter the atmosphere in a secure and controlled fashion. Congressional action on the budget and confirmation of the new NASA administrator will extend over several months, and we are unlikely to know the outcome immediately.

It was noted that a robotic servicing mission which will install both COS and WFPC3, recharge the batteries, and attach a de-orbit module to HST, will cost NASA about 1.3 billion dollars. This is only twice the cost of a de-orbiting only mission, which must be performed.

2. HST Status and Outlook [Rodger Doxsey]

The STUC is pleased to see that operations continue at normal efficiency, and that the rework of the Archive has reduced access time to a mean of a 1/2hour for direct retrievals not requiring processing.

A TGM test was run on 21-23 February 2005. Gyro 1 was left on but not used during the testing. The main test was done using the ACS/HRC/F555W and an exposure time of 100s, showing virtually no degradation in performance. The results do not seem to be impacted by the magnitude of the guide stars, i.e. the increase in the PSF FWHM as the magnitude of the guide star is decreased is significantly smaller than natural PSF variations which occur within an orbit due to focus breathing and jitter (such changes can be of order 0.2 pixels). Further testing was done using exposure times between 50 and 500 seconds. The mean FWHM was 2.009 pixels (compared with 1.98 for three gyro mode). Tests were also done with NIC1/F110W, and no degradation was noticed. More tests were done with the coronagraphs on both ACS and NICMOS.

The STUC heard a report of the impressive tests of Two Gyro Mode, which have led to no degradation in the PSF, even when using V=13 guide stars. The implications are that while sky availability will be reduced by Two Gyro Mode, orient restrictions in the available sky will be unchanged. Our congratulations to the Institute and the Project.

Given that the risk of turning off gyro 1 does not appear to be high, the STUC agrees with the TAC that going to Two Gyro Mode early is a good plan. We looking forward to the GSFC and HQ decisions expected in Mid-April.

[UPDATE: NASA has asked STUC to convene a special meeting, which will be held on Weds May 4th, to gain assurance that the user community is aware of and willing to take the risks associated with turning off gyro 1.]

3. Cycle 14 TAC

The Cycle 14 TAC process was completed successfully, with oversubscription still high, though slightly lowered, probably due to loss of STIS. Cosmology and galaxies still dominate the science areas, with most observing time being with the ACS.

Very few of the Cycle 14 programs are impacted by TGM. If TGM is activated, the switch-over date will be chosen to minimize impact on Cycle 13 programs, and will likely be around August 1st, i.e. after the Deep Impact Observations (scheduled for July 4). Most remaining cycle 13 programs will continue without GO intervention. STScI has already contacted the PI of the cycle 13 programs which might be affected.

1. There was concern about the factor ~4 underuse of Chandra and Spitzer time awarded by the HST TAC. HST allows Chandra and Spitzer to award 100 orbits/ observatory. For comparison some 150 orbits are awarded by each HST panel. Most HST-awarded Chandra time is for coordinated observations, while much CXC-awarded HST time has no time constraints. STUC is concerned that the time awarded for Observatories other than the main one a TAC is convened for is not vetted at same high level as HST-only time, for example. The TAC finds that the 'double jeopardy' of having to convince two TACs is in general reasonable, given the scarce resources being allocated. An exception is time critical coordinated observations, including ToOs. For this purpose we support the retention of the joint awarding of time. We suggest that the Institute look at the productivity of jointly awarded time by means of the standard metrics. With these results a review of the use of this time should be undertaken with the other Great Observatories. The STUC would like to hear the results of this review at its next meeting.
2. STUC members who were on the TAC noted some confusion about TAC instructions. (In particular whether panel members were expected to read all proposals or not, and to send comments prior to the meeting). We are pleased that new summary instructions will be produced for Cycle 15 that briefly highlight the most important tasks and responsibilities of panel members.
3. The purpose of the 'Previous Observations' section of HST proposals has become unclear: Is it to demonstrate effective use of previous awarded time, or to show that the proposers are knowledgeable about the use of HST? STScI report that the vast majority of proposals lead to published papers in refereed journals, mostly by the original team. (STUC would like to see these numbers.) Hence the first possible use may be unnecessary. We suggest that STScI look at options for this problematic section. Possibilities include: (1) Clarify the purpose and contents [e.g. "include only PI papers published in refereed journals for time awarded in the last 3 cycles"] of the section, both in the call for proposals and with the TAC; (2) Change the section to be 'Team Roles', as for Spitzer, or 'Previous Team Experience' in similar science; (3) Drop the section entirely. (4) Substitute an STScI print out of PI/co-I accepted proposals and papers

published, using Archive/ADS links. The STUC hopes to hear the Institute's considered opinion at its next meeting.

4. Archival Program: The Archival program proposals grew in Cycle 14, and this may be a long term trend. A difficulty is the support on postdocs on 1-2 year grants. The approximate distribution of GO funding is currently: Observations ~\$20M, ARCH+THEORY ~\$3M, FELLOWS ~\$2.6M. The STUC discussed at length the balance between these areas, and within the Archive area as a function of proposal size. No recommendation to change balance. Can't solve scarcity of long-term funding in astrophysics, highlighted by the cancellation of the FY05 LTSA/ADP programs. This is a larger question beyond STUC's scope.

4. STIS Closeout

The closeout plan for STIS, to create a legacy quality archive, appears to be well thought out, having a good schedule, FTE loading and deliverables. It would be useful to have the new presentation available on the web, and STScI are happy to do this. It is important to gather the STIS expertise into products, software and documentation before the teams disperse. A servicing mission would delay this schedule. In view of the recently announced FY05, FY06 cuts we encourage review of low priority items in view of the resources likely to be available. The STUC members involved with STIS (Axon, York) volunteer to give input to this process.

A concerted effort must be made to amalgamate the best practice of the IDT and the institute in legacy pipeline and tools for UV spectroscopy data. This will require minor additional funding from NASA for the IDT.

The STUC is pleased that, following a user request to the STUC, non-standard STIS observations have been classified and that a policy is being developed for their incorporation in the archive. We urge STScI to work with original observers in the more difficult cases to deposit their data products in the archive in a useable form.

For future instrument closeouts the STUC asks STScI to call for expert user input at early stage of closeout planning (e.g. by email, web clearinghouse). (The original drizzle web page is a good example.)

5. NICMOS Photometric non-linearity

Comparison of NICMOS/NIC3/grism and STIS fluxes, in the wavelength region where they overlap, shows that the NICMOS/STIS flux ratio depends strongly on the NICMOS (or STIS) flux counts. Comparison with ACS data shows that the problem lies with NICMOS. The effect seems to be wavelength dependent, occurring primarily at short wavelengths (8000 Å). No bias is noticed at 1.6 microns.

MULTIACCUM data show a deficiency in the count rate in the first few steps of the ACCUM. Such count loss would result in underestimating the NICMOS counts, and is likely the result of charge traps which exist in crystal defects at the interface between the sapphire substrate and the semiconductor layer. The charges are trapped at the beginning of the MULTIACCUM sequence; when an equilibrium is reached depends on the brightness of the source (brighter sources are less affected).

In practice, the problem is most severe for observations shorter than the 160s, which represents the trap-release time. Few science observations are shorter than this; therefore most data would not be affected.

The discovery of this bias might prompt a change in the recommendations for best observing strategies. At present, STScI recommends to break up longer observations in several short dithered integrations, although this might not be the best practice, at least at short wavelengths.

Finally, there seems to be a NIC/F110 - J ~ 0.15-0.20 mag offset in the photometric zero points (by comparing NICMOS and ground based J photometry for targets in the HDF). The F160W magnitudes seem to agree with the H band ground based magnitudes.

The STUC is pleased that this effect was uncovered and that a solution is available.

6. Project Visit at GSFC: HRV facility, Project Status, Meeting with Director.

The STUC visited GSFC to hear from the Project and to view the lab where robotic servicing work is progressing. The hardware shown was: (1) a full scale volume mock up of the 'ejection module' which would carry the new instruments, the DEXTRE robotic arm and its tools, and in which the old instruments would be placed after removal. This module would then be detached from HST and de-orbited; (2) a working DEXTRE being operated 'remotely' (from the lab floor but out of sight of the robot) to detach cables from their original connectors on HST and reattach them to new connectors; (3) mock-ups of COSTAR, WFPC2, WF3 and COSTAR with attachments that DEXTRE can use or install itself. STUC watched the successful detachment and reattachment of connectors.

The STUC thanks the HST Project for hosting a tour of Hubble Robotic Vehicle (HRV) test facilities. We were impressed by the technology demonstrations, and by the spirit, skill and can-do attitude of the team. Our congratulations on highly successful PDR for HRV. The success of the HRV PDR gives sense of reality to effort. We wish them well for their CDR in October.

1. Dr. Ed Weiler, GSFC Director, met with the STUC. GSFC has not received orders to stop work on HRV, while Congress has required NASA to spend the \$291M allocated for this purpose. Hence work is continuing at GSFC on HRV. The cost of Hubble servicing is widely talked of at ~\$1.2B. This includes the Shuttle launch for a manned servicing mission. However NASA has stated that the cost of servicing was already budgeted, and a de-orbit mission has to be in the longer term budget to comply with NASA's safety rules. Compared with these two combined, and allowing for the cost of maintaining the core experience until a later de-orbit mission, HRV requires only a relatively small extra investment and would return much new science. Dr. Weiler feels HRV team has met all PDR goals, and is on track for CDR in October.
2. Servicing: GSFC is studying two options: the 'Hubble Robotic Vehicle' (HRV) which includes servicing the gyros, FGS and instruments (the hardware for which was shown to the STUC, see above); the 'De-Orbit Only Mission' (DOOM) which attaches only a de-orbit engine to Hubble. DOOM uses many elements from HRV (autonomous rendezvous & capture, grapple arm) but with many fewer than the 40 cameras on HRV as there is much less fine scale work to be done. DOOM needs only a Delta II launch, while HRV needs a Delta IV or Atlas V. Both options recently passed their PDRs and are proceeding to CDR in October 2005.

The STUC strongly supports HST servicing. The STUC finds that WF3 and COS are vital to continued progress in astrophysics with Hubble. We also recognise that restoring STIS to operations, while a technical challenge, would have major scientific benefits. The STUC is pleased that more than one servicing option exists. STUC considers DOOM (De-Orbit Only Mission) to be a short-sighted approach.

3. The HST MO&DA has been directed to be reduced by \$20M this fiscal year (FY05). This is about 25% of the budget. An additional \$12M cut has been directed for FY06. FY05 impact is worsened as the fiscal year is half way through. The STUC is alarmed to see such significant

cuts applied in the middle of a fiscal year. The STUC is of the opinion that the GO program must be protected. A secondary concern is the impact on user services and support.

4. The WF3 IR background was very worrying. We are relieved that a solution has been found within budget, and that result is a major QE increase. The STUC notes that the independent and timely evaluation of the detectors has been crucial to the successful development of WF3 instrument. The STUC is looking forward to an update on the WF3 IR detectors status at the next meeting.
5. Dave Leckrone reported on the process by which a decision on the deliberate switch to TGM would be made. He also reported on the new 'HST Year Book' which shows science highlights from Hubble for the past year. The STUC agrees that the having the selected authors of HST Year Book science highlights be all white males was highly regrettable and does not properly reflect the HST user community. The community reaction was strong; many members of the STUC each heard from several members of community about this, an unusual circumstance. We also note that the great majority of astronomers came from the Baltimore-Washington area. The proximity of the ACS team and the large ACS projects based at the Institute makes such a concentration plausible, but again fails to reflect the national and international nature of the Hubble user community. We are pleased that steps will be taken to avoid similar situation in future, and suggest that an outside panel be convened (using phone and email) to generate the next list of highlighted science.

7. Future Data Processing Plans

A level of effort move is underway, to produce enhanced archive products. The STUC applauded this move at its previous meeting.

The STUC is worried about the impact of the just announced MO&DA cuts on this vulnerable area. Servicing would not have a major impact on these plans as the scheduling and pipelines for COS,WF3 are ready. (The impact would be in calibration and documentation.) The STUC offers to read the draft plan and provide input on priorities and scope (by email).

8. CONTACT SCIENTIST AND PROGRAM COORDINATORS

STUC members report some problems with Phase 2 support. With Two Gyro Mode there will be more scheduling issues, requiring Program Coordinator and Contact Scientist coordination. STUC is pleased that the Institute recognises that there are some issues in this area and that it will be taking positive steps to improve the process. STUC considers that a thorough review of proposals by Contact scientists and Program Coordinators is instrumental in improving Hubble science.

9. Capturing Community Expertise

Several suggestions were presented for capturing expertise in the community at a level less than that of fully robust pipelines: (1) A contributed software page, as at the CXC; (2) A 'contacts' page for users to advertise their expertise in specific areas; (3) A 'contributed memos' page for users detailing procedures they use to solve data analysis problems. These all sound like good proposals to the STUC. The STUC notes that capturing STScI expertise in software, products and on-line documentation is also important for old instruments in order to guard against inevitable loss of knowledge as people move on. The same methods may be useful in this case too.

10. Thanks To The Outgoing Director

The STUC thanked the outgoing STScI Director, Steve Beckwith, for his work, in particular his helpful dealings with the STUC.

11. Summary of Requests For Input At Next STUC Meeting

- Update on servicing options.
- Update on budget situation.
- Updates on TGM decision, operations; HST lifetime estimates.
- Cycle 15: Report on Joint HST/Chandra/Spitzer time productivity and discussions with other Great Observatories; steps to clarify instructions for TAC
- STIS closeout prioritization (with input from STUC members D. York, D. Axon), progress; IDT input to legacy pipeline tools.
- Update on WF3 IR detectors.

12. Dates of Next STUC Meeting

The next regular STUC meeting will be held on Tues-Weds 25-26 October 2005.