

Space Telescope Users' Committee (STUC) Report: May 4-5, 2017

STUC Attendees : Stéphane Charlot, Hsiao-Wen Chen (Chair), Dawn Erb, Cynthia Froning, Ana Gomez de Castro, Søren Larsen, Mercedes Lopez–Morales, Patrick Slane, Keren Sharon, Amy Simon, Benjamin Williams

Meeting Summary: The STUC is pleased to see that Hubble continues to operate at an optimal level. Not only does the scheduling efficiency remain high, but both the mission office and the instrument teams also continue to work with users to introduce new modes of observations and to facilitate effective explorations of the data archive. The committee is encouraged by the news that the ESA/Hubble funding will continue at current levels through 2018 and probably until 2020. The committee remains excited about the prospect of simultaneous access to HST and JWST for maximal scientific returns. The STUC saw presentations on topics, including the STScI (K.Sembach), ESA (A.Nota), and HST Project updates (J.Wiseman and P.Crouse), HST Mission Office report (T.Brown), status reports of STIS, COS, ACS, and WFC3 (J.Debes, C.Oliveira, N. Grogin, E.Sabbi), NASA Perspective (M.Garcia), HST TAC process (C.Leitherer), Science Policy (I.N. Reid), COS Bright Object Protection (R.Osten), future plans for COS (J.MacKenty), STScI web update, (H.Jirdeh), Data Science Mission Office (I.Momcheva), and JWST update (N.Lewis). This report summarizes the key issues and recommendations of the STUC.

NASA Perspective

It is widely recognized both inside and outside NASA that HST is operating at the top of its scientific productivity, but it was also suggested to the STUC that funding support for HST programs may be reduced in the JWST era. The STUC re-iterates that HST and JWST offer complementary capabilities (e.g., UV observations enabled only by HST; med-resolution IR spectroscopy enabled only by JWST). There is a strong synergy between HST and JWST; in many science cases HST observations are critical for achieving the full scientific return of JWST programs. HST GO and Archival funding is essential to support the data analysis and scientific yields of the programs and is a key reason why HST has been a ground-breaking facility and remains one of the most productive missions in the NASA portfolio. A uniform reduction of all HST programs in the JWST era risks terminating a highly productive Great Observatory at its peak performance, while compromising JWST's scientific achievements.

- **Recommendation (1):** The STUC strongly endorses the continued healthy funding of HST GO and Archival programs in the future. The committee requests clarifications from NASA on the rationale used for budgeting allocations for different missions that provide complementary capabilities in light of flat-funding expectations, and encourages STScI to consult the astronomical community for the best actions.

Science Policy and TAC Process

The STUC is pleased to see that STScI has taken the initiative to engage social science experts on analysis of biases in the TAC selection process. The committee looks forward to updates from the full analysis. In anticipation of JWST, several changes have been made or are being considered for the Hubble programs. These include: pre-allocation of Cycle 26 orbits in Cycle 25 for proposals in the small category, re-evaluation of the appropriate balance between large, medium, and small proposals, and re-consideration of the funding paradigm.

- **Recommendation (2):** The STUC recommends that the STScI begins working as soon as possible on a structure that facilitates productive cross-talks between JSTUC and STUC in order to optimize the return of space science in the initial epoch of overlapping operations of these missions. The topic of discussions should include: synergistic opportunities to exploit the complementary capabilities of JWST and HST, joint proposal opportunities, and strategies to minimize duplicated proposals and funding requests.
- **Recommendation (3):** The committee encourages the STScI to continue the current practice of program balance and the TAC review process, which have been demonstrated to be productive, but to re-evaluate the balance at a later time as deemed necessary. The committee also suggests STScI to consider relaxing the criteria for mid-cycle proposals in Cycle 26 to accommodate new ideas and new opportunities that arise in the next proposal cycle but cannot be done in available proposal categories.

Instrument Status

The STUC applauds all instrument teams for their continuing effort in maintaining efficient operations and in developing new modes of observations for high-yield science products. The committee was impressed with all the improvements made to ACS and WFC3, but noted that some clarifications might be appropriate for the calibrations for a subset of the ACS/SBC filters. The committee was pleased to learn of the joint effort between the users and the STIS team to implement a new spatial scanning mode in STIS that delivered by far the highest-quality G750M spectra, reaching SNR=600-800 (Cordiner+2017, arXiv:1705.01501). The committee commends the COS team for their continuing effort on maintaining the productivity of COS and on improving the quality of its archival data. The STUC endorses the plan to postpone the move to LP4 to October 2017, to align the new observing mode adoption with the HST cycle calendar.

- **Recommendation (4):** The STUC encourages all instrument teams to continue the improved calibrations efforts, including pursuing focus tracking, and focus-dependent PSFs for both ACS and WFC3, and to update the instrument handbooks as soon as a new observing mode becomes available so that it is widely known by the general users. The committee also recommends that efforts be made to understand the causes of and provide

solutions for under-utilized modes (e.g., polarizers in ACS) and unpublished data, in particular to assess if the lack of return is due to difficulties in calibrations.

Data Science Mission Office and High Level Science Product

The STUC is pleased to see the plans of the newly created Data Science Mission Office (DSMO), which go beyond archive products and include data management and processing, analysis tool development and distribution, and accompanying data systems. These tasks include responsibilities for running data pipelines, but not for development or maintenance of pipeline software. The specific goals include frequent and flexible re-processing of archival data, improved data analysis tools, access to high-level science products, and potential connections between HST and other facilities (e.g., LSST). A particular focus will also be on a transition from IRAF to python-based routines or workflows. The STUC commends the Hubble Spectroscopic Legacy Archive (HSLA) team for their great effort in providing the community with science-quality FUV spectra obtained using COS. The committee is pleased to see that this effort is further extended to include COS NUV data and UV spectra obtained using STIS.

- **Recommendation (5):** The STUC suggests the DSMO to explore the possibility of incorporating lessons learned and products available from the ESO archive to maximize functionality, while providing the highest scientific return. The committee recommends that the HSLA team includes a statement on their website to help users acknowledge the team's effort in papers that make use of HSLA products. In addition, the committee also encourages the HSLA team to turn the ISR that describes HSLA into a PASP paper for a broader reach to the community.

Future Plans for COS

The STUC appreciates the careful work undertaken by STScI to investigate the usage of COS and formulate a plan for future observing plans to maintain the full scientific capabilities as long as possible, with the goal of providing overlap with JWST. The committee was presented a hybrid model that includes restricted number of FP-POS and the possibility of returning to previous LP, which will extend the lifetime of COS beyond 2023 with some tradeoff in observing overheads and in continuous wavelength coverage. The committee also welcomes the continued investigation of the feasibility of a new LP5 position. While an increase of the FUV detector high voltage above the CARD limit will not be pursued for several years at the earliest, this is an appealing potential response for continuing COS science operations in the last year or two of its lifetime. The COS instrument team sees no risk to the FUV detector from increased voltage, even at voltages well above the level (HV 179) tested during thermal vacuum characterization before launch. However, STScI and GSFC must consider potential risks to the overall facility -- instrument and telescope -- in the event of a failure.

- **Recommendation (6):** The STUC endorses the recommended hybrid program as a good balance of observing modes, detector and mechanism usage, and observing efficiency. There was not a clear decision on whether two or four FP-POS modes in G130M/1291 was the better choice. The committee recommends that two FP-POS positions be the mode in the next cycle but leave open the option to change to four positions at a later date if community demand suggests it is the better scientific choice.
- **Recommendation (7):** The STUC recommends that the usage risk of aperture-block moves be investigated for the new LP5 position with regular wavelength calibration observations. Alternately, the impact on science quality should be investigated, if drift is not tracked via wavecal (e.g., the frequency of drift corrections reducing resolution, especially when there is insufficient continuum S/N to correct for drift in software by tracking interstellar lines). The committee also recommends that STScI gather information about the failure modes of the detector during higher voltage operations now, while members of the instrument team are available to answer detailed questions. This information will be important to have available in the event that a waiver to allow raising the HV is considered at a later date.

COS Bright Object Protection

UV spectroscopic observations of M dwarf stars is a growing use of COS and STIS, with Cycle 24 seeing more COS observations of these targets than in all the previous cycles combined. Because of their potential for flaring, M stars represent a bright object protection (BOP) concern for COS and STIS MAMA observations. The new screening measure adopted by the STScI, while providing a consistent standard for protecting the facility, appears to have imposed an extreme barrier for carrying out these new programs. The committee recognizes the importance of rigorous BOP for COS and STIS/MAMA. Failure to properly screen can lead to local charge extraction on the detector, an unplanned detector shutdown affecting telescope and instrument scheduling, or a catastrophic failure of the detector (an unlikely but possible occurrence). The STUC also recognizes that the HST mission is actively investigating this issue and is open to alternative scientifically-justified criteria submitted by the community. The STUC will return to the M dwarf UV community and request submission of white paper(s) presenting newly published or unpublished data for re-evaluating the current estimate of flaring probability and outlining their concerns with the new BOP screening limits.

- **Recommendation (8):** The STUC encourages STScI to give careful considerations to the community input on BOP. The committee also encourages a proactive approach for obtaining community input, including soliciting whitepaper(s) and investigating other ways of discussing this with the community, such as a video conference with key stakeholders.