



STScI | SPACE TELESCOPE
SCIENCE INSTITUTE

EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

HST Senior Review Preparations

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STUC meeting, Nov. 14, 2018



The Purpose of NASA's Senior Review

Congressionally mandated

- Independent, comparative reviews of operating missions to maximize the scientific return from these missions within finite resources
- NASA uses the findings from the Senior Review to define an implementation strategy and give programmatic direction to the missions and projects concerned through the next four fiscal years.

This established practice was codified in the NASA Authorization Act of 2005 (Public Law 109-155), Section 304(a): “The Administrator shall carry out biennial reviews within each of the Science divisions to assess the cost and benefits of extending the date of the termination of data collection for those missions that have exceeded their planned mission life time.”

from NASA response to 2016 Senior Review for Astrophysics Operating Missions



HST in the Senior Review

History

- 2012 was first Senior Review for Hubble after SM4
 - 9 missions (incl. HST) reviewed in full panel
 - Info and panel report: <https://science.nasa.gov/astrophysics/2012-Senior-Review-Operating-Missions/>
- 2014
 - Separate panel each for HST, Chandra; full review
 - Info and panel report: <https://science.nasa.gov/astrophysics/2014-Senior-Review-Operating-Missions/>
- 2016
 - Separate panel each for HST, Chandra; “Delta” review
 - Info and panel report: https://science.nasa.gov/astrophysics/2016-Senior-Review-Operating-Missions



HST in the Senior Review

Report covers a broad range of topics related to scientific results, use of resources

- Scientific results
- Scientific productivity
- Observatory operations
- Science operations
- Budget & staffing

The important scientific return of HST, along with good stewardship of resources in both mission operations and science operations, have been called out in all three of the Senior Reviews in which Hubble has participated.



HST in the Senior Review

From NASA's response to the 2016 Senior Review:

Hubble Space Telescope

The Hubble mission is directed to continue planning against the current budget guidelines. Any changes to the guidelines will be handled through the budget formulation process. The Hubble mission will be invited to the 2018 Astrophysics Senior Review. Current planning is that the 2018 Senior Review for Hubble will be another incremental review, not a full review.



Next Senior Review

Changed to 3 year cadence; next review in 2019

Next review is a full review

The execution of the 2019 Senior Review follows the assessment, prioritization, and NASA response to the 2016 Senior Review (<http://science.nasa.gov/astrophysics/2016-senior-review-operating-missions/>). The following missions will be included in the 2019 Senior Review:

- Chandra X-ray Observatory (CXO)
- Fermi Gamma-ray Space Telescope (Fermi)
- Hubble Space Telescope (HST)
- Neutron Star Interior Composition Explorer (NICER)
- Nuclear Spectroscopic Telescope Array (NuSTAR)
- Neil Gehrels Swift Observatory (Swift)
- Transiting Exoplanet Survey Satellite (TESS)
- X-ray Multi-Mirror Mission-Newton (XMM-Newton)

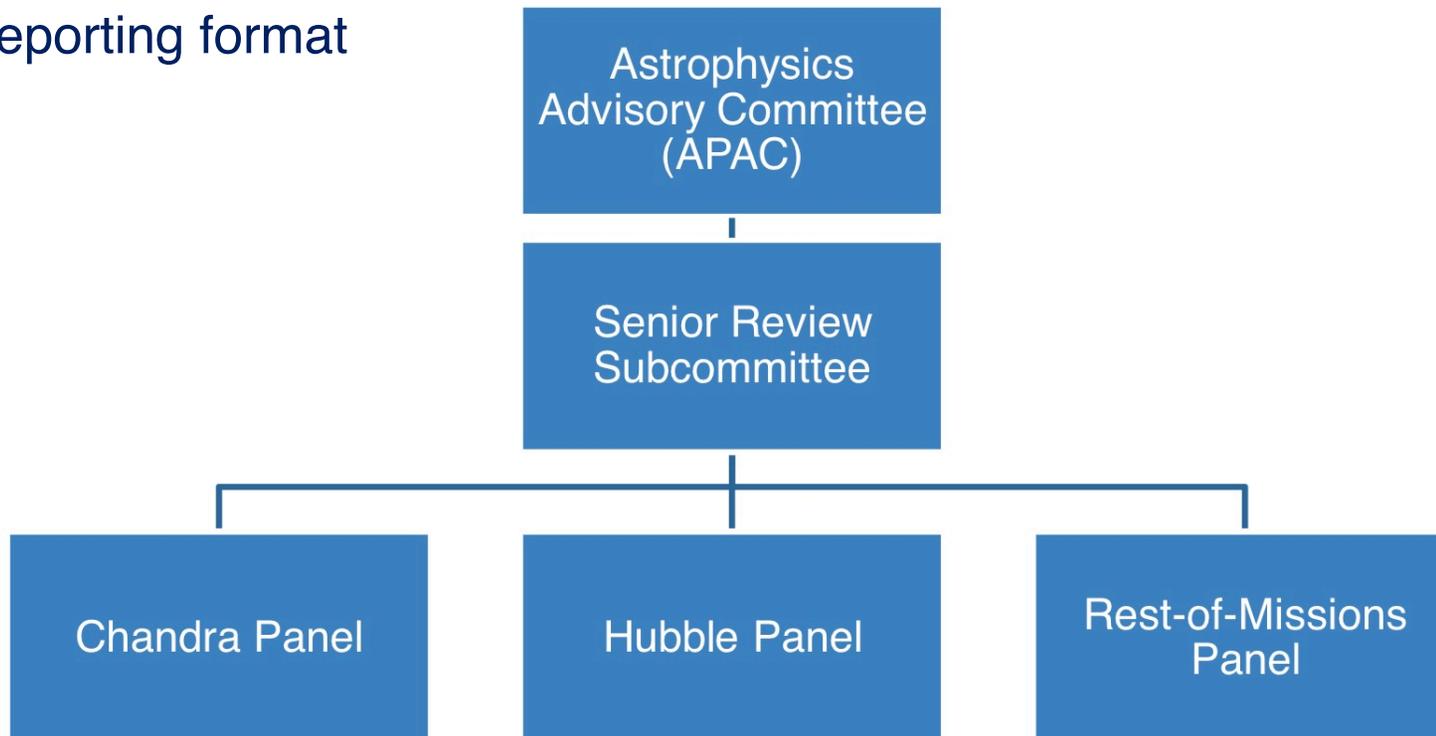


Next Senior Review

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Next review is a full review

New reporting format





Next Senior Review

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Timeline:

- Final Call for Proposals final CfP released: Nov. 2 2018
- HST-P & STScI work on proposal: Oct.-Dec. 2018
- Red team review: Dec. 14, 2018
- Proposal due: Feb. 1, 2019
- Hubble panel meeting and site visit in Baltimore, MD: Feb. 25–27, 2019
- Panel reports delivered to Senior Review Subcommittee: April 2, 2019
- Senior Review Subcommittee meets: April 10-11, 2019
- Senior Review Subcommittee report delivered to APAC: April 25, 2019
- Special APAC meeting: May 8-9, 2019
- NASA Response/Direction to projects: May-June 2019



Specification for Senior Review (from CfP)

Proposal should address the following areas specifically and in conjunction with the PMOs identified for the next 3-5 year planning cycle:

1. **Scientific merit**, including that of the project itself, and its unique capabilities and relevance to the stated Astrophysics research objectives and focus areas as part of the overall Astrophysics mission portfolio. Missions having a comprehensive and extensive GO/GI program should be prepared to discuss the relative merits and scientific productivity of these programs compared to alternate sources of research funding within the Astrophysics Division Research and Analysis portfolio
2. **Promise of future impact and productivity** (due to uniqueness of capabilities, wavelength coverage, etc.) (again, missions with GO/GI programs should be prepared to discuss the promise of those programs)
3. **Progress made toward achieving the PMOs identified in the 2016 Senior Review proposal** (for missions that were subject to the 2016 SR)
4. **Impact of past scientific results** as evidenced by publications, citations, press releases, etc., and how that ties into future promise
5. **Broad accessibility, usability, and utility of the data**, both as a unique mission and as a member of the Astrophysics mission portfolio, focusing on the cost efficiency, technology development, data collection, archiving, and distribution
6. **Spacecraft and instrument health and safety**
7. **Level and quality of observatory stewardship** (e.g., maximizing the scientific return while minimizing the ongoing costs)
8. In the context of the expected lifetime of the mission, the project's **plans to prepare for the future** by providing the training, mentoring, and leadership opportunities that will expand the skills of its staff, as well as foster the next generation of mission leaders
9. **Effectiveness of communications and communications plans**, including communication with the science community and the general public



Review Criteria for Senior Review (from CfP)

Criterion A: Scientific Merit (50% weighting)

Factor A-1: Overall scientific strengths and impact of the mission.

Factor A-2: Expected scientific output and “return on investment” over the requested funding period.

Factor A-3: Incremental and synergistic benefit to the Astrophysics Division Mission Portfolio.

Factor A-4: Quality of data collection, archiving, distribution, and usability.

Criterion B: Relevance and Responsiveness (25% weighting)

Factor B-1: Relevance to the research objectives and focus areas described in the SMD Science Plan. Relevance to the scientific goals of the Astrophysics Division as defined in the Division’s Strategic Objectives and the 2010 Astrophysics Decadal Survey.

Factor B-2: Progress made toward achieving PMOs in the 2016 Senior Review proposal (for missions included in the 2016 SR).

Factor B-3: Performance of addressing any findings in the 2016 Senior Review (for missions included in the 2016 SR).

Criterion C: Technical Capability and Cost Reasonableness (25% weighting).

Factor C-1: Cost efficiency of the mission’s operating model in terms of meeting the proposed scientific goals.

Factor C-2: Health of the spacecraft and instruments, and suitability of the mission’s operating model (e.g. governance, science team, instrument team) to maximizing its scientific return.

Factor C-3: In the context of the expected lifetime of the mission, the project’s plans to prepare for the future by providing the training, mentoring and leadership opportunities that will expand the skills of its staff, as well as foster the next generation of mission leaders.

Factor C-4: Current operating costs.



Prioritized Mission Objectives, Updated Based on STUC Input

Programmatic

PMO1	Keep Hubble's instruments and subsystems healthy and safe so that great science can continue out to 2025 or beyond
PMO2	Mitigate known instrument or system degradation in a manner consistent with maximizing science
PMO3	Identify and if practical, implement operational efficiencies that reduce costs without compromising science, or enable new science within the current cost profile

Scientific

PMO4	Support high-profile community-driven science as established through peer scientific review
PMO5	Enhance scientific discoveries through improved archive interfaces and experiences
PMO6	Optimize the unique UV scientific capabilities of Hubble
PMO7	Enable pathfinding science for JWST by utilizing Hubble's unique resources



Budget Scenarios

Senior Review proposal is required to provide a plan for at least the first, and optionally two more, of the following three budget scenarios:

(1) An “in-guide” plan (required)

Projects must present a plan for a budget consistent with the funding level set in the April, 2015 Astrophysics Planning, Programming, Budgeting and Execution (PPBE) process. Each project must propose an in-guide plan, which follows the NASA Astrophysics budget guideline for the period under review. Where an out-year guideline is zero, projects must propose to their last Astrophysics PPBE submission.

(2) An “under-guide” plan (required)

Projects must present a plan and budget that would allow for continued operations at a level below their in-guide budget. By identifying such a minimum acceptable funding level, the project is indicating that any further reduction is untenable, and that the project should be terminated rather than be funded at a level lower than the under-guide level. The science/technical/budget description of this scenario should address the reduced scope compared to the in-guideline scenario. The difference in return (science, technical, spacecraft health and safety, etc.) compared to the in-guideline plan should also be clearly identified. If a project assesses the in-guide budget to already be the minimum level for continued operating, then this must be explicitly stated in the proposal.

(3) An “over-guide mission” plan (optional)

Projects may present an over-guide plan and budget if the proposed in-guide budget poses a significant (self-assessed) risk to the continued operations of the mission. The proposed over-guide budget should be included with full cognizance of the very tight fiscal constraints that NASA faces. In other words, this over-guide request should be a carefully considered request, not a maximal request. The description of this scenario should address the added scope and expected benefits compared to the in-guideline scenario. The added return (science, technical, spacecraft health and safety, etc.) from the over-guide versus the in-guideline plan should be clearly identified. The budget section should explicitly detail the use of the additional requested funds. The added return should be clearly connected to the additional budget required (over the current NASA Astrophysics budget guideline) so that the reviews can evaluate none, some or all of the added return and estimate the budget required for partially funding any proposed increases.



Senior Review Proposal Outline

Executive Summary	3.2.4 Joint- & Mission-Supporting Programs	4.1.3 Flight Software
1. Introduction	3.2.5 Fundamental Physics	4.1.4 SI C&DH
2. Progress from 2016 Senior Review	3.2.6 Cross-observatory synergies (LIGO, LSST, transient WG)	4.1.5 Power & Thermal
2.1 Updates on 2016 Prioritized Mission Objectives	3.2.7 UV SFH DD program	4.1.6 Comms & Storage
2.2 Response to 2016 Senior Review Report	3.3 Science Demand, Impact, Productivity	4.1.7 Orbit
2.3 2019 Prioritized Mission Objectives	3.4 Science Operations	4.1.8 Science Instruments
3. Science and Science Implementation	3.4.1 Science Selection	4.1.9 Spacecraft control center
3.1 Science Results	3.4.2 Planning & Scheduling	4.1.10 Science Center
3.1.1 Black Holes	3.4.3 Instrument Support	4.1.11 Mission Operations: Sustaining Engineering
3.1.2 Cosmology	3.4.4 Analysis Tools	4.1.12 Mission Operations: Lifetime Extension
3.1.3 Exoplanets	3.4.5 Archive	4.1.13 Mission Operations: Anomaly Resolution
3.1.4 Galaxies & IGM	3.4.6 Grants	4.2 Operating model
3.1.5 Solar System	3.4.7 Outreach	4.2.1 Project's Perspective on Operations and Efficiency
3.1.6 Stellar Physics	4. Technical/Management/Budget	4.3 Budgets
3.1.7 Stellar Populations	4.1 Technical Status of mission & components	4.3.1 In-guide
3.2 Initiatives	4.1.1 Pointing and Control System	4.3.2 Under-guide
3.2.1 Frontier Fields	4.1.2 Safing	4.3.3 Over-guide
3.2.2 UV Initiative		Appendices
3.2.3 JWST Preparatory		



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