2014 Astrophysics Senior Review

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The Senior Review Paradigm

NASA's Science Mission Directorate (SMD) periodically conducts *comparative* reviews of Mission Operations and Data Analysis (MO&DA) programs to maximize the scientific return from these programs within finite resources. The acronym MO&DA encompasses operating missions, data analysis from current and past missions, and supporting science data processing and archive centers.

NASA uses the findings from these ***comparative* reviews** to define an implementation strategy and give programmatic direction and budgetary guidelines to the missions and projects concerned for the next 5 fiscal years (matching the Federal government's budget planning cycle). Additionally, from 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 lifetime".

Mission Extension Paradigm

Under this call, the budgets for mission extensions beyond the prime mission lifetime (in NPR 7120.5 parlance, Prime Phase E) will support, at a lower level, the activities required to maintain operations and continue to produce meaningful and significant science data, which is adequately described and accessible to the non-specialist researcher.

- When a mission has completed its Prime Phase E, NASA will accept higher operational risk, lower data collection efficiency, and instrument/mission degradation due to aging.
- It is assumed that, along with this greater risk, the cost to implement will be at the level of approximately two-thirds (2/3) that of Prime Phase E.

As a corollary to the above direction, priority will be given to maintaining an understanding of the instrument performance, monitoring progress toward accomplishing the objectives of science observations, and to involving the science community in formulating the mission observing program to make the best scientific use of NASA's missions.

Missions Invited

This 2014 Astrophysics Senior Review will comprise three interrelated reviews.

The Astrophysics Senior Review for extended Phase E Missions will assess the merits and performance of these nine missions (in alphabetical order): Fermi, MaxWISE, NuSTAR, Planck, Spitzer, Suzaku, Swift, XMM-Newton, and possibly Kepler (K2).

The science merits and technical performance of the Hubble Space Telescope and the Chandra X-ray Observatory will be assessed in two separate, equivalent reviews.

Charge to Panel (1)

NASA HQ will instruct the Senior Review panel to:

1) In the context of the research objectives and focus areas described in the SMD Science Plan, **rank the projects**, reviewed during the period (FY15 through FY16) and the extended period (FY17 and FY18), on the scientific merit and **expected scientific returns** on the basis of NASA's **"return on investment"** for the requested funding in an era of **limited resources**. The scientific merits include relevance to the research objectives and focus areas, scientific impact, and promise of future scientific impact, as well as the incremental and synergistic benefit to the Astrophysics Division Mission Portfolio and to the scientific goals of the Astrophysics Division as defined in the Division's Strategic Objectives and the Astrophysics' Decadal Review. Missions are expected to maximize their science return and productivity. It is understood that predicting the science productivity of a mission over such a long period is speculative, but missions are asked to assume the status quo operationally; hence, the need for Scientific Project Mission Objectives in the proposal.

Charge to Panel (2)

2) **Assess the cost efficiency,** any ongoing technology development, data collection, archiving, distribution, mission and data usability, and the vitality of the mission's science team as secondary evaluation criteria. The Panel can also suggest changes in observing models or operations that would serve to increase the scientific return and/or legacy of the project in accordance with the extended mission resource allocation paradigm. In brief, is the current operating model of the project essential to the realization of its scientific return or can the "return on investment" be increased?

3) **Assess the current costs of the various missions** under review, specifically by comparing the projected science returns of existing projects with the potential advances to be gained from an alternative strategy of increased funding for other Division priorities.

4) **Consider the scientific tradeoffs** and opportunity costs involved in extending existing projects versus reducing or terminating them and using that funding for future flight opportunities, most especially in light of new Astrophysics missions expected to be launched.

Charge to Panel (3)

5**) Provide an overall assessment of the strength and ability of the MO&DA portfolio**, including new missions expected to be launched, to meet the expectations of the Astrophysics Division priorities from FY15 through FY18, as represented in the 2010 SMD Science Plan and in the context of the recent 2010 Astrophysics Decadal Survey. Provide a crosscutting, expert assessment of the scientific value provided by current MO&DA funding allocations, and suggest possible alternatives.

6) Based on the above criteria, **provide findings** to assist with an implementation strategy for Astrophysics Division MO&DA for FY15 through FY18, including an appropriate mix of:

- continuation of projects as currently baselined;
- continuation of projects with either enhancements or reductions to the current baseline;
- mission extensions beyond the prime mission phase, subject to the “Mission Extension Paradigm”; and/or,
- termination of projects.

Proposal Content (1)

Proposals need to discuss a project's potential for advancing NASA's science objectives during the FY15 to FY18 timeframe, in accordance with the instructions to the Senior Review Panel. The proposal should address the following areas specifically in conjunction with identified *Prioritized Mission Objectives* for the next 2-4 year planning cycle:

1) **Scientific merit** including that of the project itself and its unique capabilities as well as the relevance to the stated Astrophysics research objectives and focus areas as part of the overall Astrophysics MO & DA mission portfolio. Missions having a comprehensive and extensive Guest Observer/Investigator (GO) 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 & Analysis portfolio;

2) **Promise of future impact and productivity** (due to uniqueness of capabilities, wavelength coverage, etc.) during the current year planning cycle (again, missions with GO programs should be prepared to discuss the promise of those programs);

3) **Impact of past scientific results** as evidenced by citations, press releases, Nobel Prizes, etc. and how that ties into future promise;

Proposal Content (2)

4**) Broad accessibility, usability, and utility of the data**, both as a unique mission and as a member of the Astrophysics MO&DA portfolio, focusing on the cost efficiency, technology development, data collection, archiving, and distribution;

5) **Spacecraft and instrument health and safety**;

6) **Productivity and vitality of the science team** (e.g., continuity and expertise in the calibration, validation, and archiving of instrumental data, scientific research, training younger scientists, etc.). This may also include training of younger scientists from GO programs, if known;

7) **Level and quality of observatory stewardship** (e.g. maximizing the scientific return while minimizing the ongoing costs).

Due to the current uncertainty on the implementation of Education and Public Outreach activities at the agency level, a comprehensive review of any on-going activities will be deferred until after this review.

Senior Review 2014 Schedule

Draft Call for Proposals issued: August 2013
Final Call for Proposals issued: November 15, 2013

Senior Review Proposals due: January 31, 2014

CXO site visit; March 11-14, 2014
HST site visit; March 24-27, 2014
MO&DA Senior Review panel meets in Washington: March 31-April 3, 2014

Delivery of the panel's report to NASA HQ: May 1, 2014

NASA Response/Direction to projects: June 15, 2014.