

Flagship Missions for the Decadal Review
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I believe that flagship missions should be “Observatories” and need to be designed to serve the astronomical community for decades. As such, they should be capability driven – and not necessarily driven by a single science question. HST, Chandra and Spitzer are examples of this widely applicable science capability concept, and I would hope that the next flagship would be as capable and successful as those missions. While specific science questions will be used to drive the design and capability, a true flagship mission must have broad capabilities that can be used for decades as new questions arise, and not so uniquely designed and optimized around a single science goal that it is less useful for broad applications.

I also believe it is foolish to try and define the science problems that will dominate astronomy in 2037 – the likely launch date for the number 1 priority of the 2020 decadal survey. Consider the state of astronomy 22 years ago – 1993 – and ask if we could have identified then what are the “key science” questions that we are concerned with today?

Astronomy has two basic tools: imaging and spectroscopy. And despite desires to make it otherwise – technology is wavelength driven and therefore, observatories are wavelength driven.

I endorse the study of three observatories:

These should have large FOV's, exquisite angular resolution, integral field spectroscopy and high resolution spectroscopy. These are identified within the astrophysics division call:

- A) “Cold” IR (JWST band or redder – but cryo coolers, not cryogen, for maximum lifetime, with a significant ($> 5 X$) resolution improvement over JWST
- B) UV/Optical/“warm” IR (basically HST band) with 0.01 arcsecond resolution and sensitivity to perform high resolution spectroscopy down to $V_{\text{mag}} = 29$.
- C) X-ray with spectroscopy of $R > 10,000$, the ability to image accretion disks, and the effective area to support these goals

The community should be asked for science cases to justify the required angular/spectral resolution and sensitivity. These science cases will be the starting point for the SDT's.

The exo-planet characterization is a focused mission, and the current techniques/technologies needed to achieve its goals will render the observatory less

broadly capable and I do not believe that such a mission can meet the “breadth standard” for a flagship observatory. Therefore, I feel that it should be studied as a focused, probe class mission.