

National Aeronautics and
Space Administration



EXPLORESCIENCE

Refining the Solar Terrestrial Probes
and Living With a Star Programs
in the Next Decade

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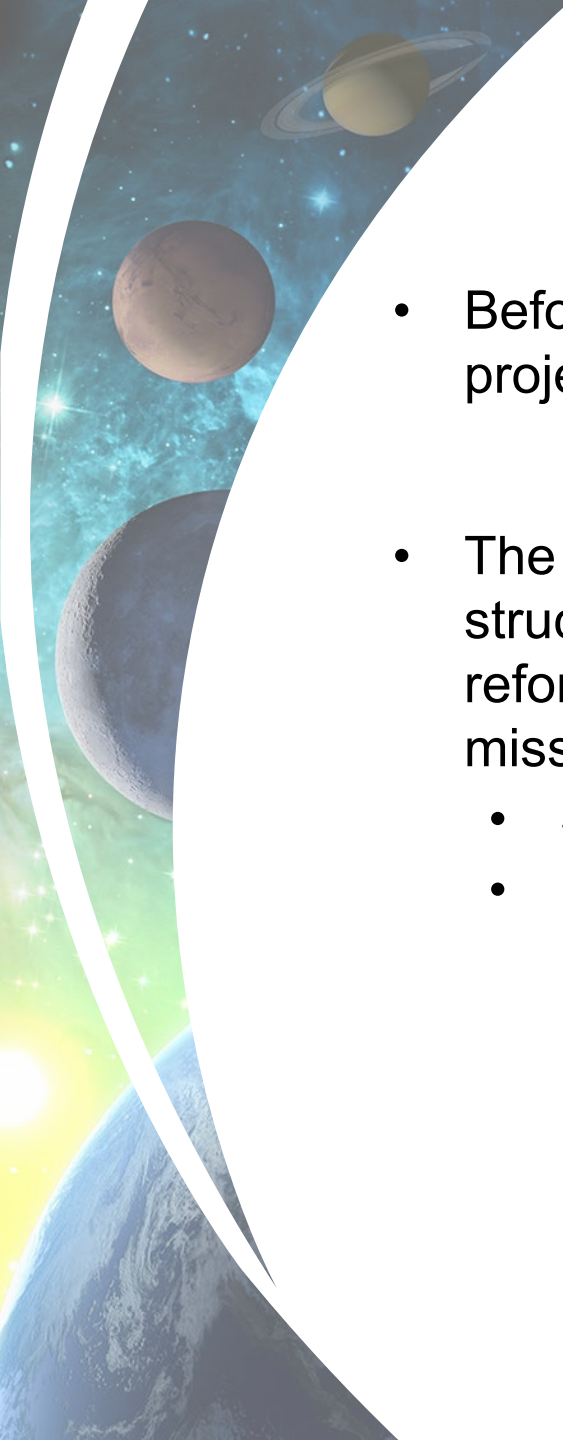
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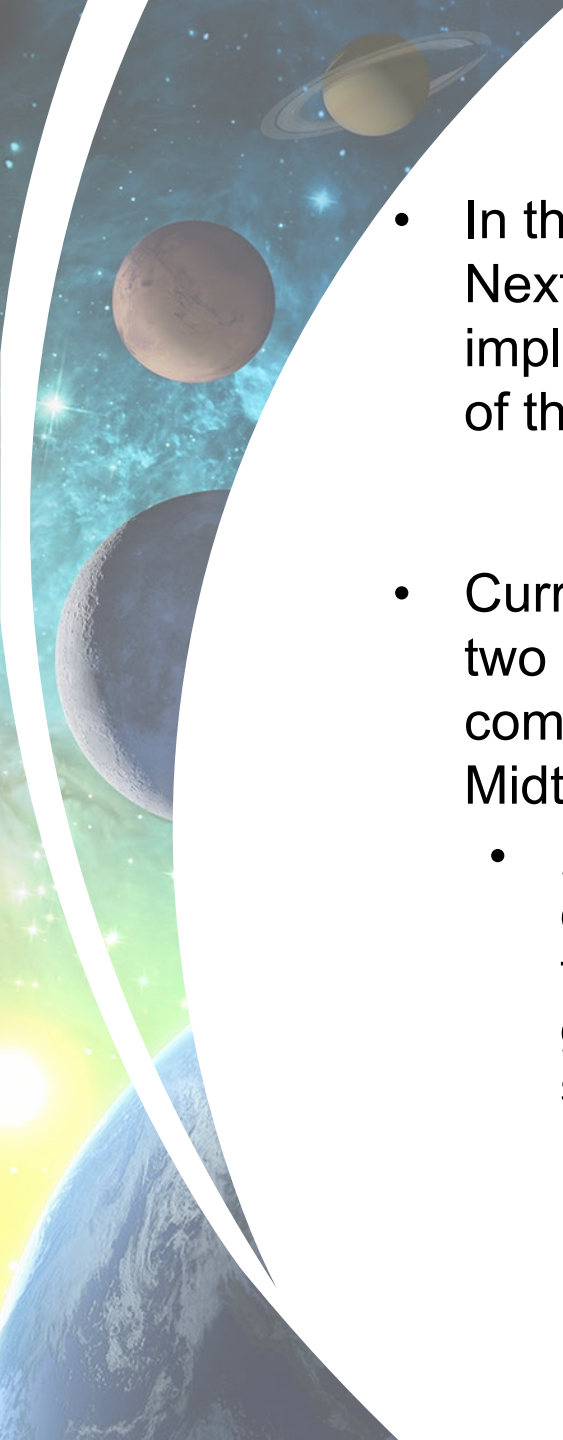
Introduction

- National Academies recommendations
 - 2013 Decadal Survey
 - 2013 Decadal Survey Midterm Assessment (2020)
- 2024+: Strategic mission programs, strategy and implementation
 - Desired program outcomes
 - Focusing of, distinguishing between programs
 - Division of decadal survey, Agency roles
- 2013-2021 Solar Terrestrial Probes, as implemented (for discussion)



Decadal Survey

- Before the 2013 Decadal Survey, all STP missions had directed (or partner-led) project management and competed science teams (including instruments).
- The 2013 Decadal Survey referenced Planetary Science Division's mission program structure (i.e., Discovery/New Frontiers) and recommended that STP and LWS be reformulated to distinguish them based on 1) project management paradigm, and 2) mission cost cap [R3.0].
 - STP: PI-led, competitively selected, decadal-specified cost cap.
 - LWS: Directed, competed science/instruments, larger-than-STP mission cost.



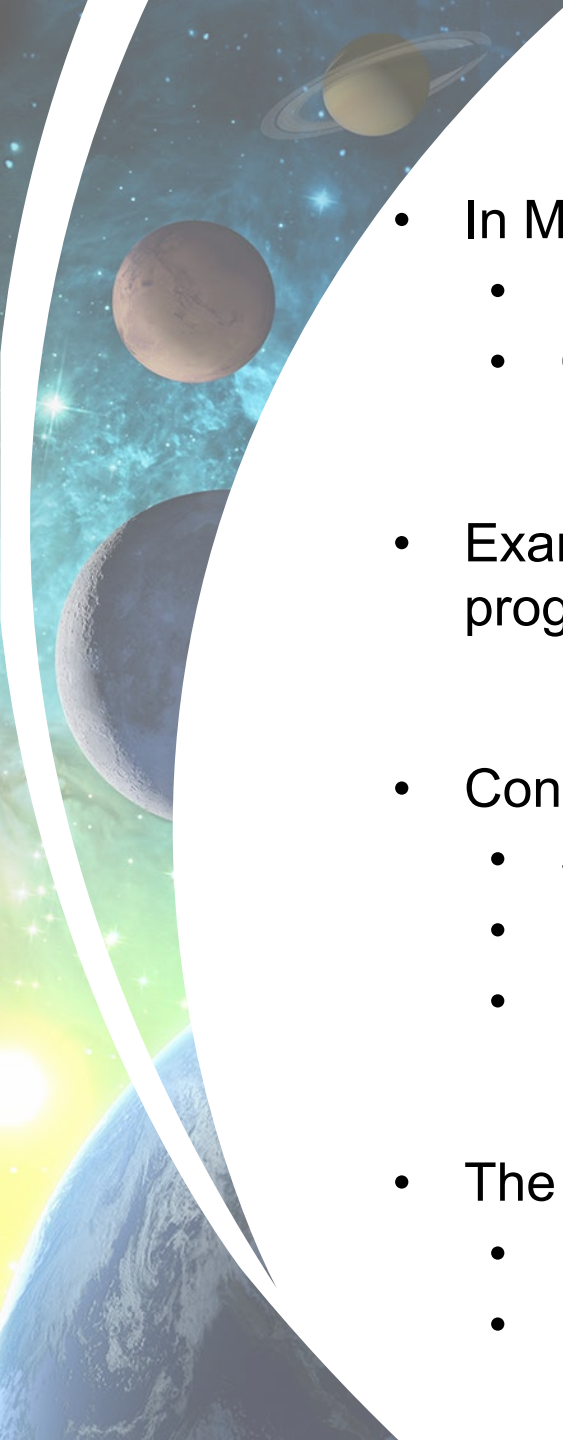
Decadal Survey Midterm Assessment

- In the 2013 Decadal Survey Midterm Assessment (Section 6.2, “Considerations for the Next Decadal Survey Process”), the National Academies discussed the implementation issues that had arisen from this formulation and suggested a revision of the program definitions.
- Current program implementation “is not an effective long-term scenario to maintain two distinct programs, nor for planning a regular cadence for strategic missions that comparably advance the different heliophysics sub-disciplines.” [2013 Decadal Survey Midterm Assessment, p. 6-4]
 - *Finding 6.5:* The next decadal survey committee may want to consider how to best distinguish the NASA Heliophysics LWS and STP strategic mission lines, both in terms of critical science goals and implementation strategies. Without distinct goals for these two programs, there is a risk to limit effective planning for larger strategic missions.



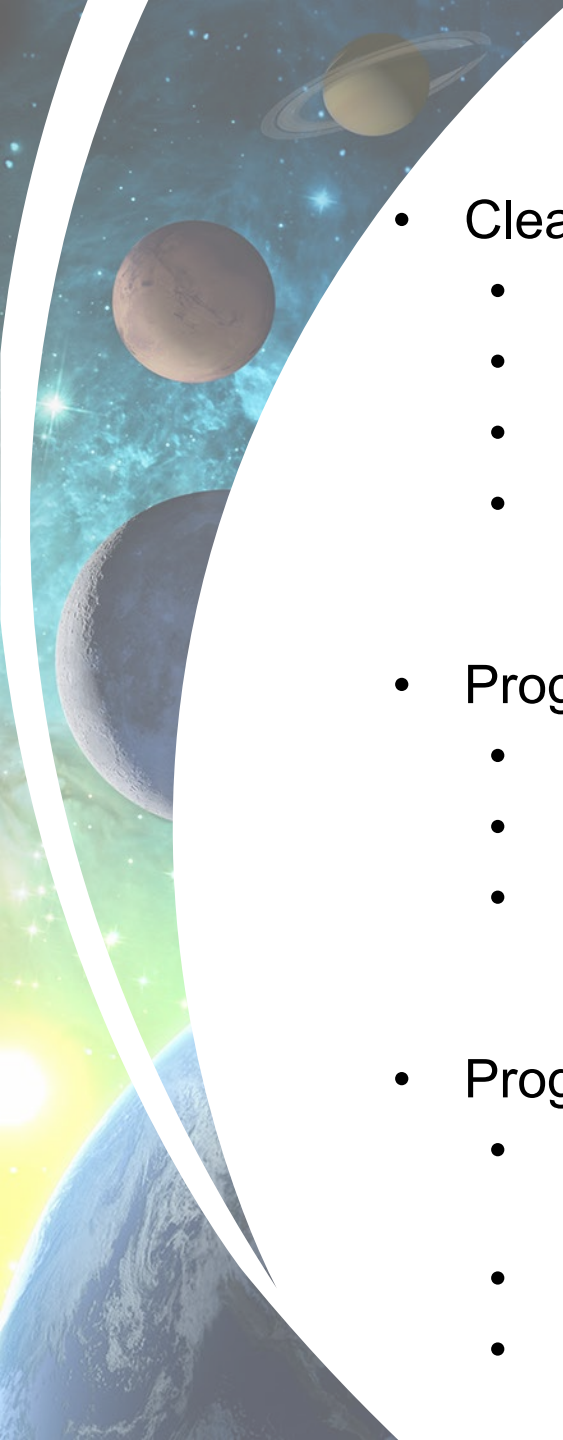
Decadal Survey Midterm Assessment

- In the 2013 Decadal Survey Midterm Assessment (Section 6.2, “Considerations for the Next Decadal Survey Process”), the National Academies discussed the implementation issues that had arisen from this formulation and suggested a revision of the program definitions.
 - *Recommendation 6.3:* [...] To address the evolving needs for science-driven strategic plans, the agency sponsors should ensure the following items are included as tasks for the next decadal survey committee:
 - Definition of distinct science goals and implementation strategies for NASA’s Solar Terrestrial Probes and Living With a Star programs[.]
 - *NASA response:* NASA agrees that it is important for programs to have distinct science goals and implementation plans, and is currently conducting internal discussions to distinguish the scopes and boundaries of the Solar Terrestrial Probes and Living With a Star programs. These discussions are based upon the referenced need for a scientific basis that is able to evolve with the Heliophysics Division’s, the Agency’s, and the Nation’s needs. NASA's intention is to produce a plan for those programs, after which NASA would seek comments and input from the science community. **A final plan for the two programs would then be published in time for the next decadal survey.**



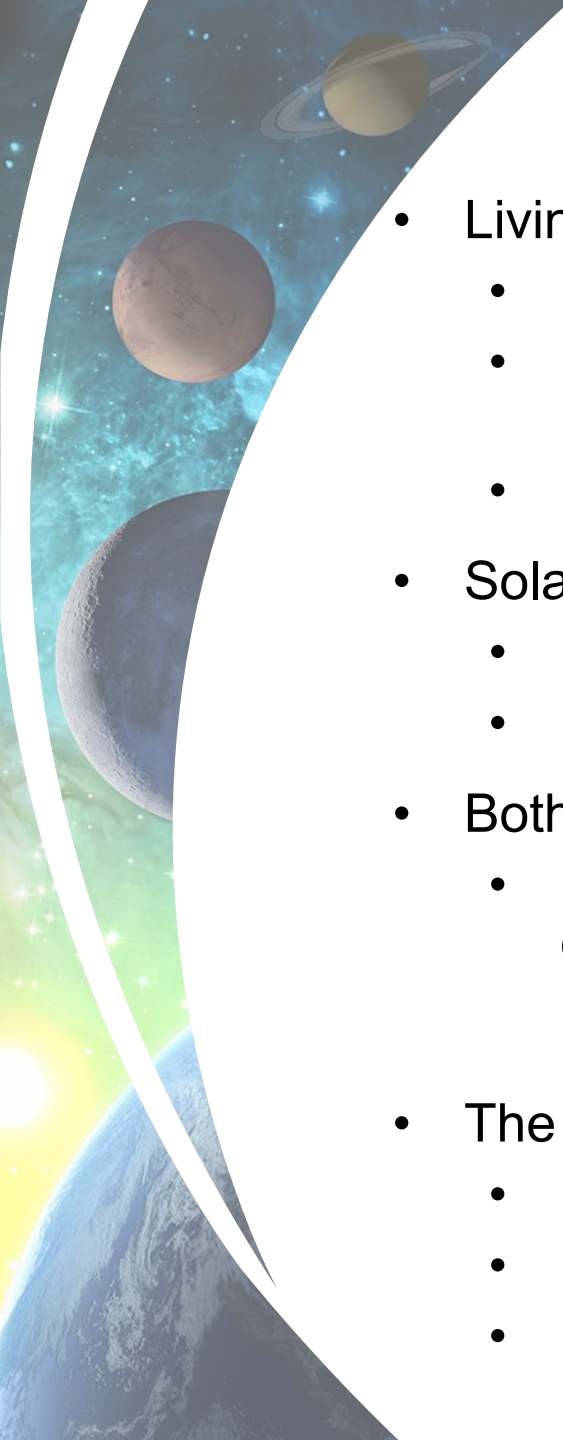
STP-LWS Strategy Formulation

- In May 2019, internal Division working group stood up to consider STP and LWS
 - Better distinguish the two programs
 - Optimize their response to Agency needs
- Examined previous and current STP and LWS guiding documents, program intents, programmatic needs
- Considered multiple program implementations based upon different factors
 - Science topic, science target, science maturity
 - Mission implementation details
 - Programmatic structure
- The strategy here is the one that was deemed the best option by the Division
 - Implementation issues, including Midterm Assessment's comments
 - Programmatic alignment with Agency programs, activities



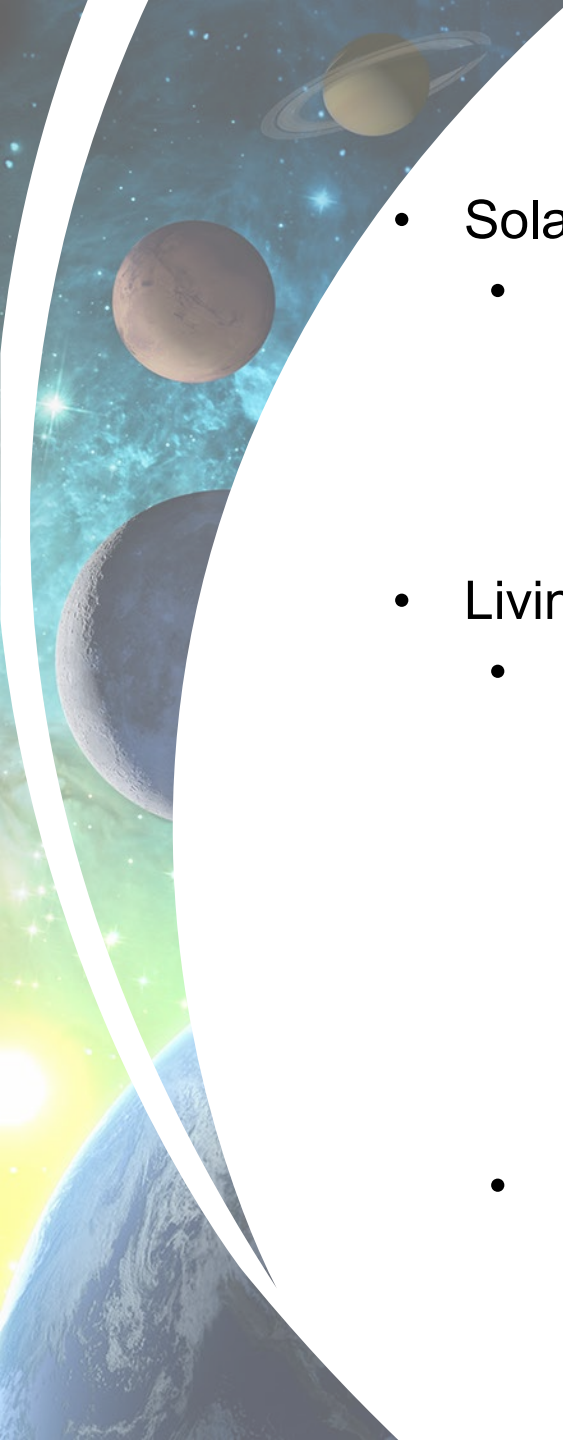
STP-LWS Strategy, Desired Attributes

- Clear definitions that...
 - ...flow from and to program goals and objectives;
 - ...do not overlap with one another;
 - ...are objectively distinguishable; and
 - ...permit immediate, exclusive assignment of missions to a mission line.
- Programmatic structure that is...
 - ...mature (e.g., well documented, follows set processes, provides accountability);
 - ...agile and responsive; and
 - ...accessible to stakeholders.
- Programmatic content that has...
 - ...a basis in science goals and objectives and not specific mission implementations;
 - ...a clear role in larger Agency activities; and
 - ...a clear link to a multi-decadal science strategy.



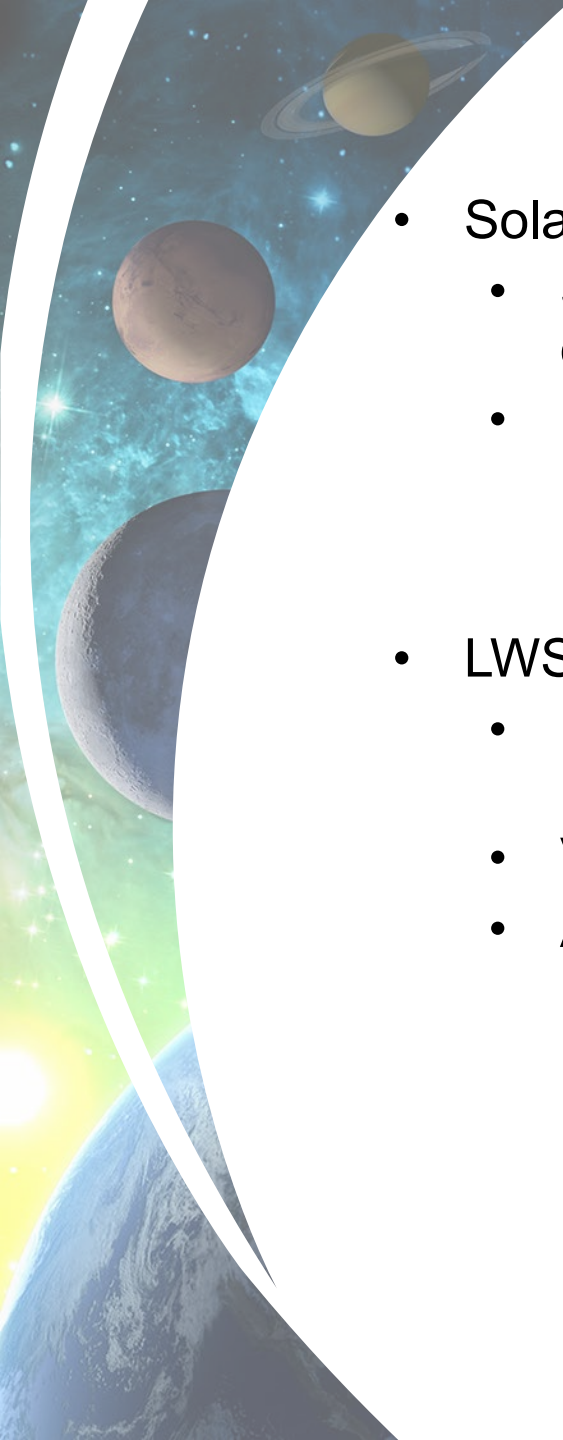
STP-LWS Strategy, Heritage

- Living With a Star
 - Focus on interconnected space environment's impact on life and society
 - Program structure where science focus flows from particular system aspects to narrow science objectives
 - Motivation is moving to prediction and forecasting
- Solar Terrestrial Probes
 - Focus on significant scientific progress for the entire heliophysics field
 - Focus on short-, medium-, and long-term strategic needs
- Both programs
 - Multiple missions in development at a time, enable an active program executing a coordinated study of the interconnected physical system
- The community has already been having significant discussions
 - Key concepts
 - Naturally combine to form a strategy to implement the STP and LWS programs
 - Inherently address the Midterm Assessment



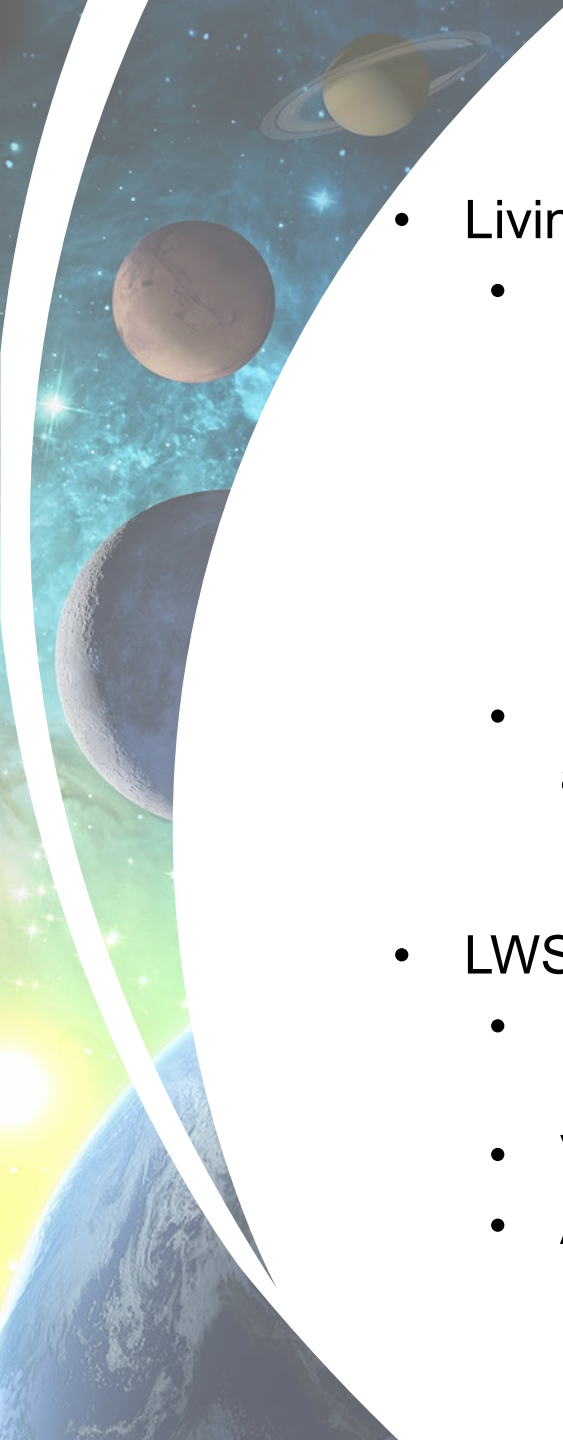
STP-LWS Strategy, Heritage

- Solar Terrestrial Probes
 - Focus on significant scientific progress for the entire heliophysics field
 - Advance by “target[ing] ‘weakest links’ in the chain of understanding” [Sun-Solar System Connection Roadmap 2005-2035, Roadmap 2009-2030]
- Living With a Star
 - Focus on interconnected space environment’s impact on life and society
 - “...focused increasingly on quantification and prediction...” [2013 Decadal Survey]
 - “...specific questions needed to understand the linkages among the interconnected systems that impact us.” [Heliophysics Roadmap 2009-2030]
 - “LWS flight missions will provide unprecedented new data sets and new insights into the physical mechanisms that underlie the Sun-Earth connected system.” [Living With a Star TR&T Definition Team Report]
 - Living With a Star Science (TR&T)
 - Strategic Science Areas (very broad, long-term)
 - Focused Science Topic (moderately broad, short-term)
 - Investigations (narrow, short-term)



STP-LWS Strategy, Solution

- Solar Terrestrial Probe: Focus on broad-based advance of heliophysics
 - Support missions that address general knowledge gaps that inhibit advancement of the entire scientific field
 - Explicitly addresses a multi-decadal strategy, inter-disciplinary science, cross-mission synergies
- LWS and STP
 - Medium- and long-term strategies addressed (e.g., technology development, pathfinder missions)
 - Variety of mission sizes, project management paradigms (PI-led vs. directed)
 - Agile response to unanticipated results, opportunities, synergies



STP-LWS Strategy, Solution

- Living With a Star: Focus on specific knowledge gaps relevant to life and society
 - Mission line adopts a modified version of the LWS Science structure
 - A limited number of fairly-focused Focused Mission Areas (FMAs)
 - Each FMA addresses targeted needs for prediction and forecasting
 - Each FMA contains specific, closeable mission objectives
 - Each FMA has clear metrics for success
 - Missions address some combination of objectives within and/or across FMAs
 - FMAs defined via programmatic needs (e.g., Division contribution to Agency activities and National needs) and scientific needs (e.g., decadal survey)
- LWS and STP
 - Medium- and long-term strategies addressed (e.g., technology development, pathfinder missions)
 - Variety of mission sizes, project management paradigms (PI-led vs. directed)
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The background of the slide is a cosmic scene. The top half features a dark blue and black space filled with numerous small, bright stars. A prominent, wispy blue nebula is visible in the upper right corner. The bottom half of the slide is a lighter blue gradient, serving as a backdrop for the text. Below the gradient, the bottom half of the image transitions into a vibrant orange and yellow nebula, with a cluster of bright stars visible on the right side.

Questions? Conversation?