Developing a Strong Research Plan

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Relevance
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Strategic Objective 1.1: Understand The Sun, Earth, Solar System, And Universe.

Conduct scientific studies of the Earth and Sun from space, return data and samples from other bodies in the solar system, peer out into the vast reaches of the universe, and play a catalyzing role in lunar robotic exploration by supporting innovative approaches to advancing science. These efforts are guided by National priorities and recommendations from the National Academies’ decadal surveys and implemented through a balanced portfolio of programs.

Lead Office
Science Mission Directorate (SMD), with support from the Human Exploration and Operations Mission Directorate (HEOMD)

Objective Overview
The success criteria for SMD are progress in answering fundamental science questions, implementing the decadal survey priorities, and responding to direction from the Executive Branch and Congress. The most recent versions of the decadal surveys for SMD can be found at:

- Planetary Science
- Solar and Space Physics
- Earth Science and Applications
- Astronomy and Astrophysics
NASA also faces challenges in carrying out this science plan. Challenges include: access to space; strategic program planning; mission cost estimation and management; maintaining measurement continuity; and balancing near-term mission and research needs against increasing longer-term technology requirements. SMD engages the science advisory committees annually to rate scientific progress. In addition, in 2005 Congress directed that the performance of each division in SMD shall be reviewed and assessed by the National Academy of Sciences at five-year intervals.

**Contributing Programs (or Projects)**
Research Question
Know Your Audience

Scientists/Engineers/Educators -- but not necessarily in your specific research niche!

Provide a thorough but concise literature review

Clearly state research question in terms of the Strategic Plan

Unpack Physical Properties versus Measureable Quantities
  -- clearly identify the link between them
Mercury expands as a function of temperature. Measure expansion on graduated scale.

Physical property (what we want to know) = VELOCITY
Measureable Quantity = Line shift (Doppler effect)

\[
\text{Hubble's Law velocity} = Hubble's\\ constant \times distance
\]
Implementation Plan: STRATEGY
Implementation Plan

Convince the reviewers that you know what you are doing

Team. *Do you have the people you need?*

- Credentials & track record
- Horizontal and vertical depth
- Roles and responsibilities
- Communication strategy
Approach

Explain how you will conduct the research

- Method
  - Experimental approach
  - Data reduction strategy
  - Data management plan

- Anticipated Outcomes/Outputs
  - What will be the product of your effort?
    - More on this in a moment
Implementation Plan, continued

**Resources.** *Do you have access to the required facilities?*

- Demonstrate that you can get what you need in a timely manner
  - Equipment, data, computational resources
  - *Do not assume!* ... make inquiries early
- Budget appropriately/realistically
  - Work with your Business Manager, start early!
Metrics & Milestones

Applied versus Fundamental Research
“On September 30th, we plan to make a fundamental discovery.”
Metrics and Milestones: Make them work for you!

**Applied Research**

**Milestone**: Fabrication facility operational; testing begun.

**Metric**: beta testing results show 25% improvement

**Fundamental Research**

**Milestone**: Experiment completed; data obtained.

**Metric**: (tougher) 1 journal paper published

Milestones are events
Metrics measure progress
Review Criteria
Review Criteria

In addition to specific criteria provided in the solicitation

**Intellectual Merit.** The potential to advance knowledge.
  --- Typically within the academic community

**Broader Impact.** The potential to benefit society and contribute to the achievement of specific, desired societal outcomes.
  --- Impact reaches beyond your academic community
Convergence

Research Strategy *du jour*

**Inter(cross)disciplinary.** Team members from multiple disciplines.

**Integrated, collaborative effort.** Research can only be successfully conducted by infusing knowledge/strategies from multiple disciplines.
Questions?

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