



Jet Propulsion Laboratory
California Institute of Technology

PI LAUNCHPAD

VIRTUAL SUMMIT

JUNE 14-25 2021

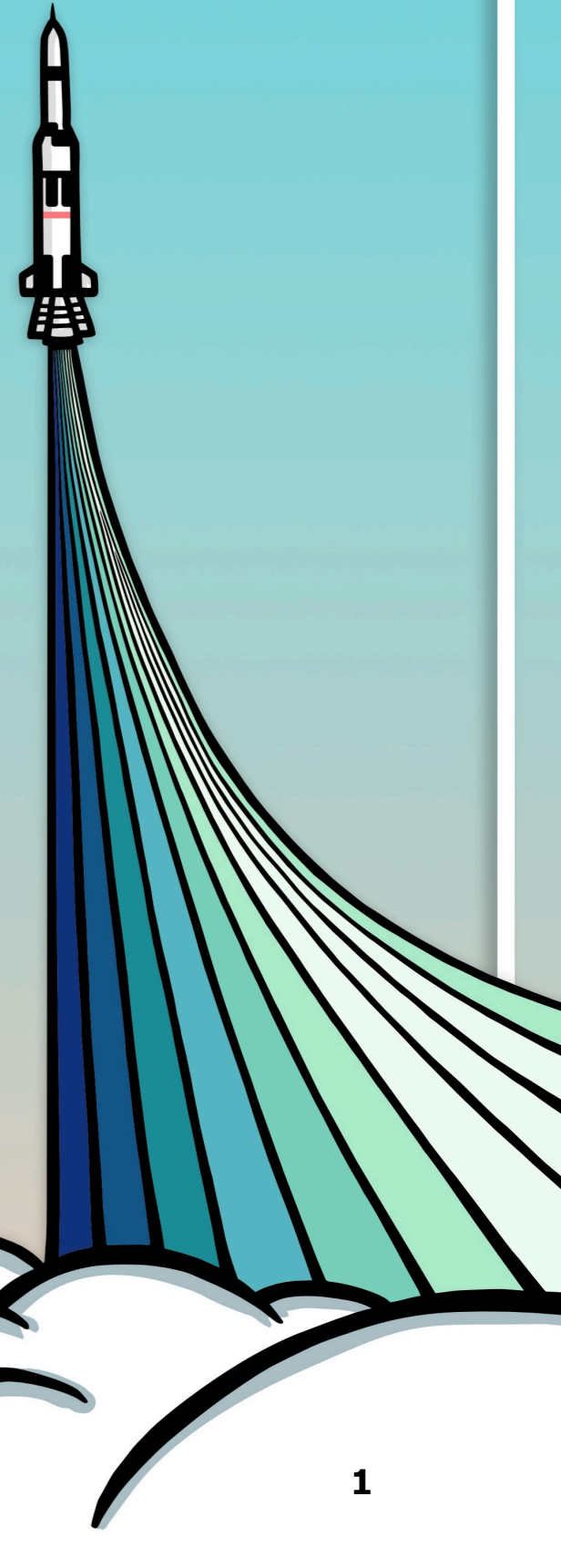
Science Case Introduction

CL#21-2321

Randii R. Wessen (JPL)

Advanced Design Engineering Group

Project Systems Engineering & Formulation Section





Agenda

- Science Mission Funding
- The Scientific Method
- Final Thoughts

Science Case Introduction

© 2021 Jet Propulsion Laboratory, California Institute of Technology. US Government sponsorship acknowledged.

9/13/21

This document has been reviewed and determined not to contain export controlled technical data.



Science Mission Funding

Science Case Introduction

© 2021 Jet Propulsion Laboratory, California Institute of Technology. US Government sponsorship acknowledged.

9/13/21

This document has been reviewed and determined not to contain export controlled technical data.



So How Do I Get My Mission Funded?

- Funds for NASA science missions are allocated in one of two ways
 - **Assigned Missions**
 - NASA establishes a Pre-Project with a Pre-Project Science Team
 - **Competed Missions**
 - Requests for mission ideas are announced via an Announcement of Opportunity (AO)
 - NASA sends out two AOs for a given opportunity
 - Draft AO released approximately 90-days ahead of the Final AO
 - Final AO starts the formal 3-month Step 1 proposal generation period
 - Opportunities can either be a:
 - 1-Step Opportunity (90-day proposal generation period)
 - Mission selection after proposal submittal
 - 2-Step Opportunity
 - Step 1 (90-day proposal generation period)
 - Down-select
 - Step 2 (Approximately 1-year Concept Study Report generation period)
 - Mission Selection after Concept Study Report submittal and Site Visit

Science Case Introduction

© 2021 Jet Propulsion Laboratory, California Institute of Technology. US Government sponsorship acknowledged.



NASA Missions Come in Different Sizes

Large & Low Risk to Small with Higher Risk

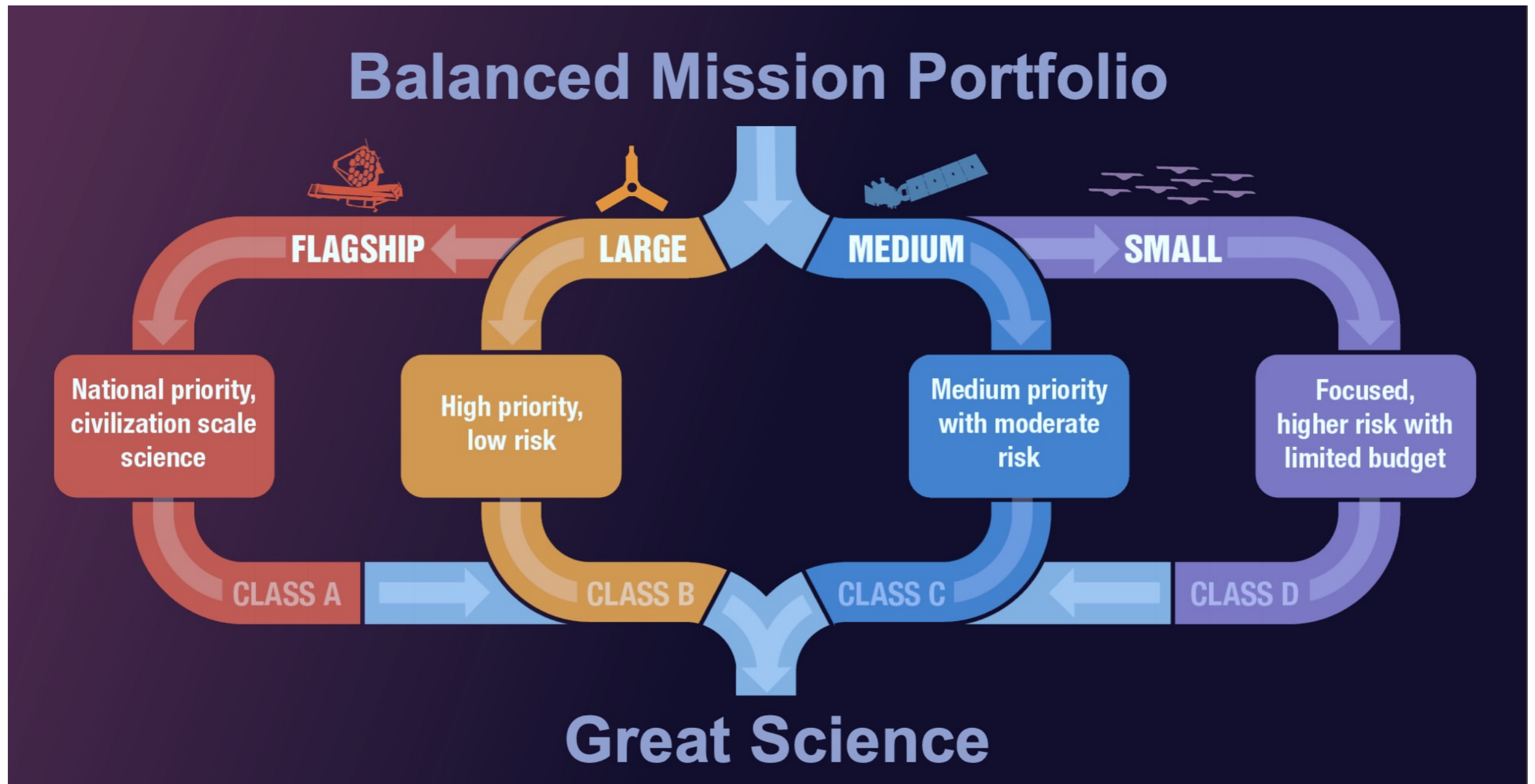
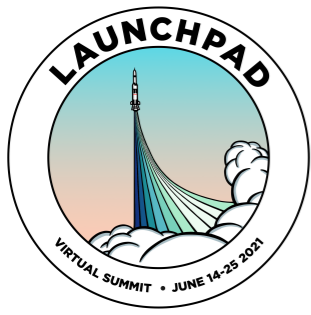


Diagram from T. Zurbuchen's "Writing Successful Proposals: Observations from NASA"

Science Case Introduction



Major Competed Science Mission Opportunities

Divided by Science Disciplines

Earth Science

- Earth Venture Suborbital (EVS)
- Earth Venture Instruments (EVI)
- Earth Venture Missions (EVM)
- Earth Venture Continuity (EVC)
- Earth System Explorers

Solar System

- Small Innovative Missions for Planetary Exploration (SIMPLEx)
- Discovery
- New Frontiers
- Biology

Astrophysics

- Pioneers
- Small Explorer Missions (SMEx)
- Medium Explorers (MIDEx)
- Heliophysics
- Astrophysics Probe

Science Case Introduction

© 2021 Jet Propulsion Laboratory, California Institute of Technology. US Government sponsorship acknowledged.



NASA Is Looking For Focused Science Missions

Discovery 2019 AO - [Solar System](#)

- "The goal of NASA's Discovery Program is to provide frequent flight opportunities for high quality, high value, **focused**, planetary science investigations that can be accomplished under a not-to-exceed cost cap..."

Earth Venture Mission (EVM) -3 2020 AO - [Earth Science](#)

- "EVM-3 missions are intended to perform **focused** science investigations that advance knowledge and conclude with papers published in peer-reviewed archival journals..."

Medium Explorer (MIDEX) 2021 AO - [Astrophysics](#)

- "The goal of NASA's Explorers Program is to provide frequent flight opportunities for high quality, high value, **focused** astrophysics science investigations that can be accomplished under a not-to-exceed cost cap and..."

Science Case Introduction

© 2021 Jet Propulsion Laboratory, California Institute of Technology. US Government sponsorship acknowledged.



The Scientific Method

Science Case Introduction

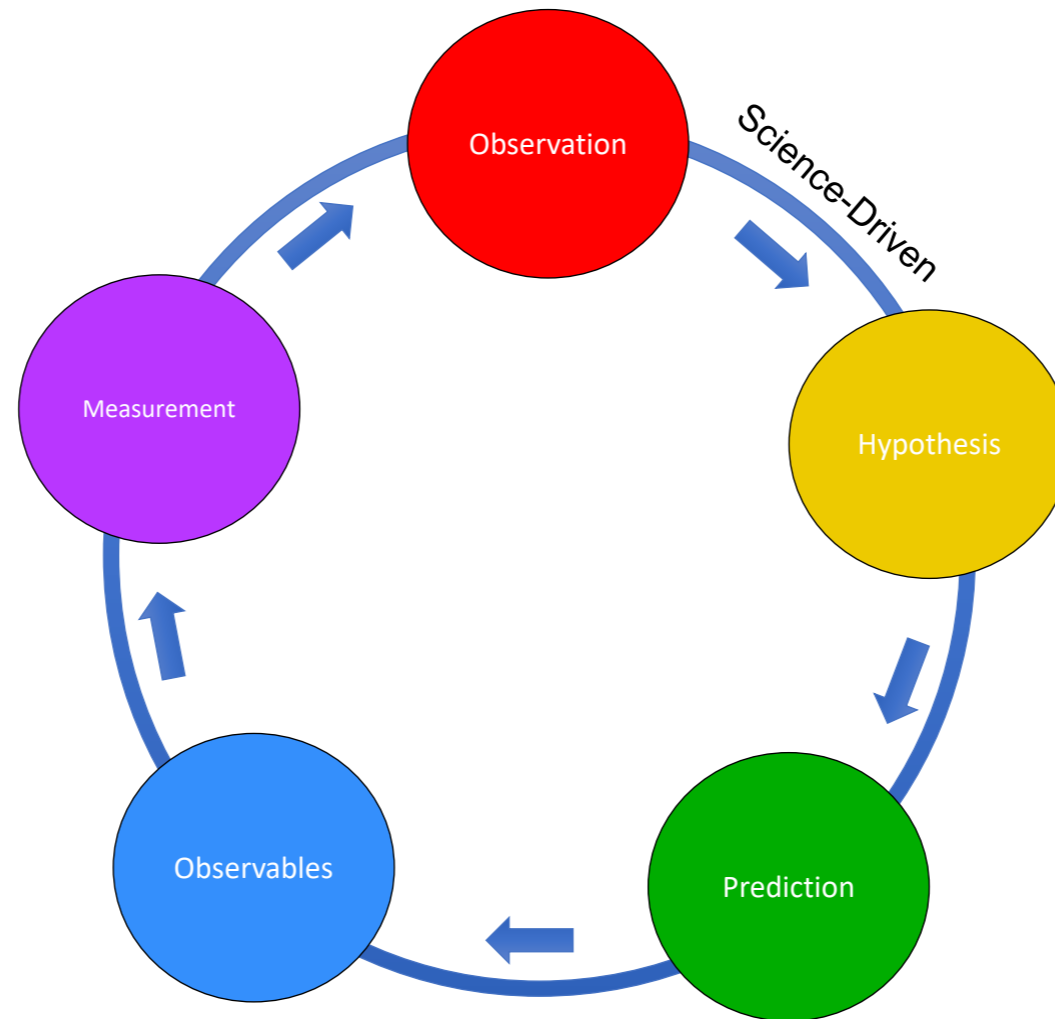
© 2021 Jet Propulsion Laboratory, California Institute of Technology. US Government sponsorship acknowledged.

9/13/21

This document has been reviewed and determined not to contain export controlled technical data.



The Scientific Method Provides a Solid Foundation for Scientific Inquiry



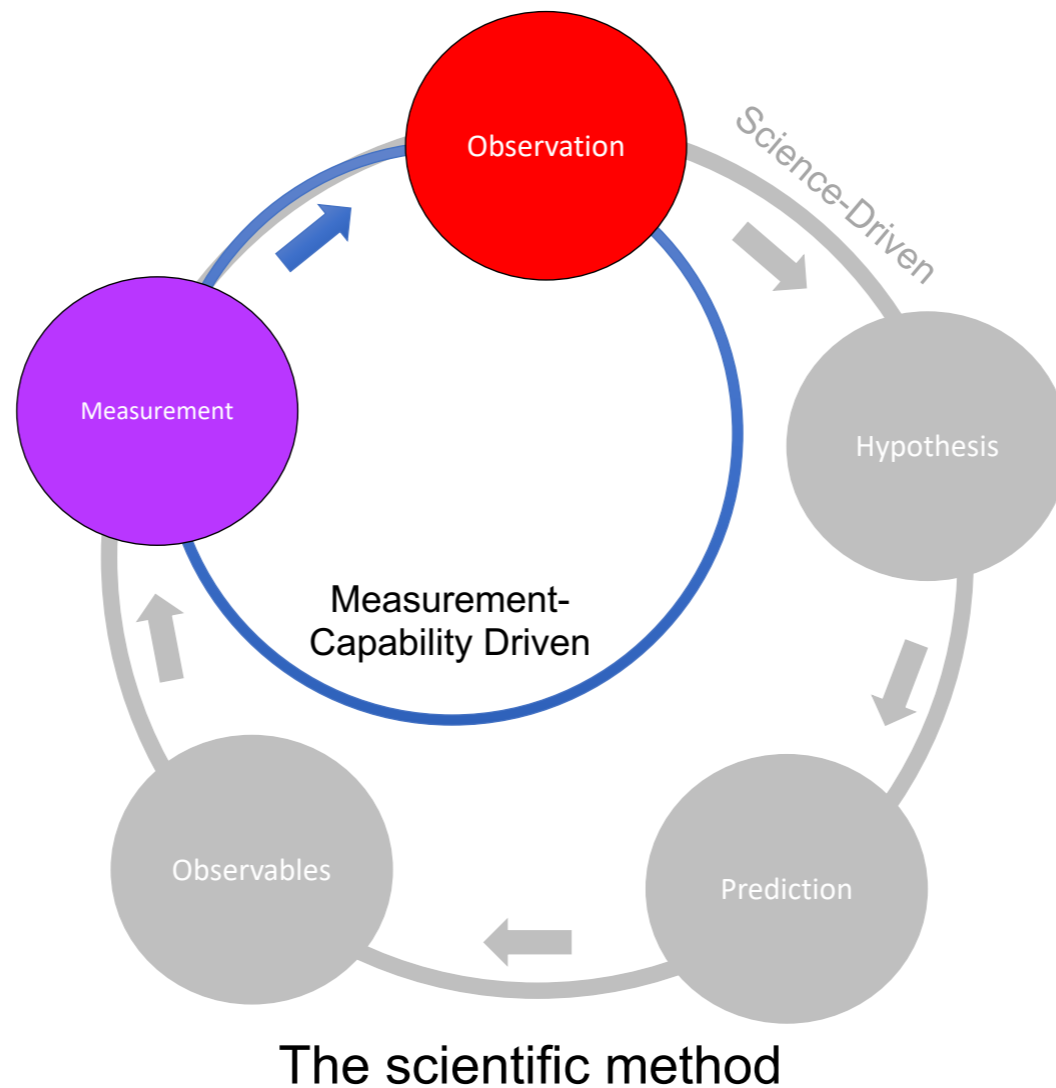
The scientific method

Science Case Introduction

© 2021 Jet Propulsion Laboratory, California Institute of Technology. US Government sponsorship acknowledged.

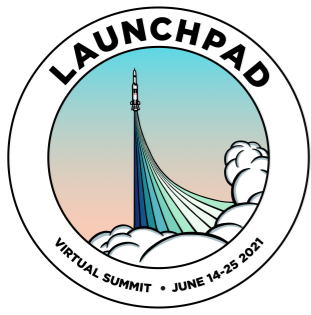


A "Short-Circuited" Scientific Method Weakens the Science Story



Science Case Introduction

© 2021 Jet Propulsion Laboratory, California Institute of Technology. US Government sponsorship acknowledged.



A Scientific Investigation Cannot be Compelling Unless it is Based on the Scientific Method

- Scientific Method
 - Observation – Must be based on a known phenomena
 - **Science Question – Must be articulated as a question**
 - Hypothesis – Must be controversial
 - Prediction – Must verbalize a future state
 - Observation – Must confirm or refute the prediction
 - **Measurement – Must be measurable and repeatable**

Science Case Introduction

© 2021 Jet Propulsion Laboratory, California Institute of Technology. US Government sponsorship acknowledged.



Final Thoughts – A Compelling Science Story Must Explain What, Why and When

- **A strong science case must**
 - **Explain the concept:** No jargon, acronyms, and understandable by an educated lay-person
 - **Why do I care?:** What information will be returned by this missions and so what?
 - **Why now?:** Why should this mission be funded now instead of some other mission?

Science Case Introduction

© 2021 Jet Propulsion Laboratory, California Institute of Technology. US Government sponsorship acknowledged.