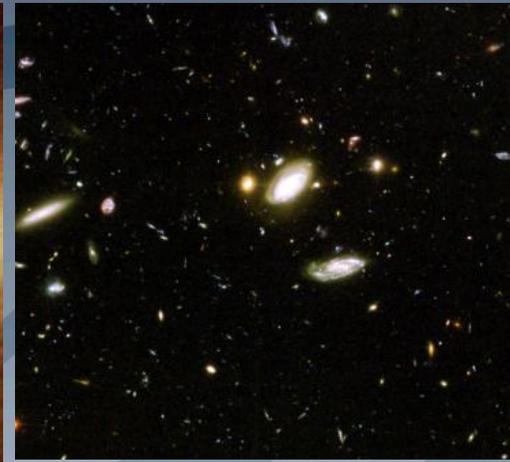




# Astrophysics



## Briefing to the Astrophysics Science and Technology Definition Teams

May 2016

**Paul Hertz**

Director, Astrophysics Division  
Science Mission Directorate

[@PHertzNASA](https://twitter.com/PHertzNASA)

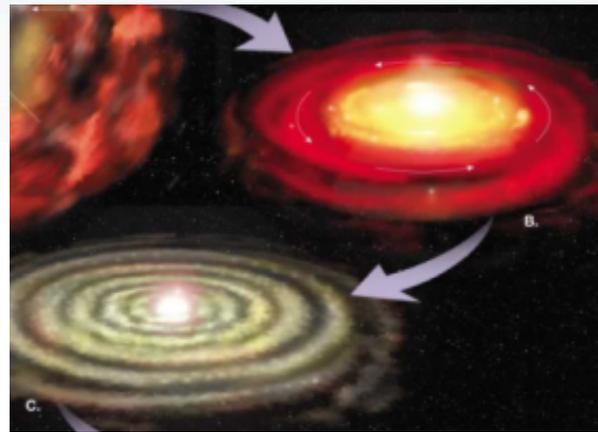
# Why Astrophysics?



Astrophysics is humankind's scientific endeavor to understand the universe and our place in it.



1. How did our universe begin and evolve?

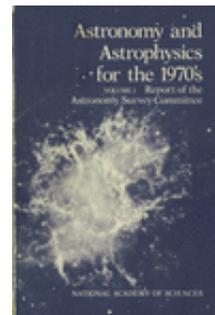


2. How did galaxies, stars, and planets come to be?

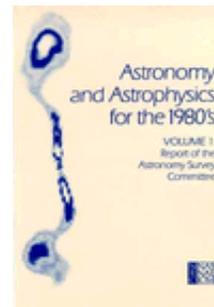


3. Are We Alone?

These national strategic drivers are enduring



1972



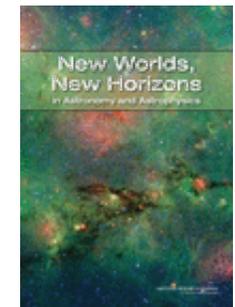
1982



1991

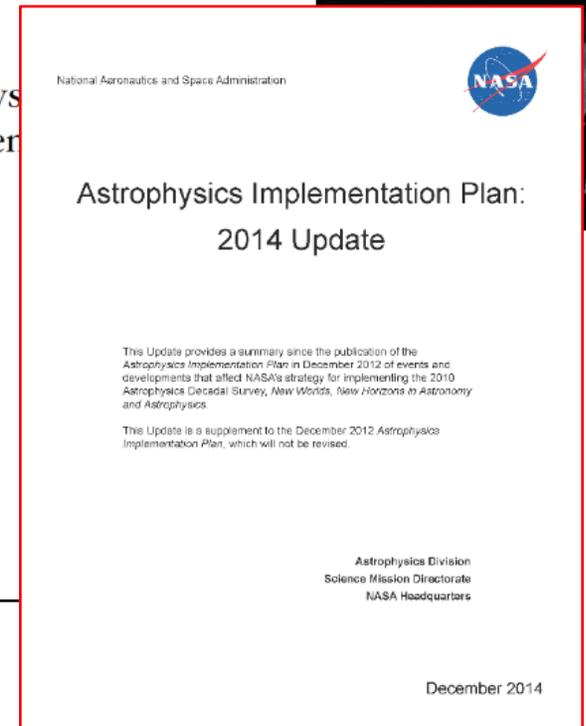
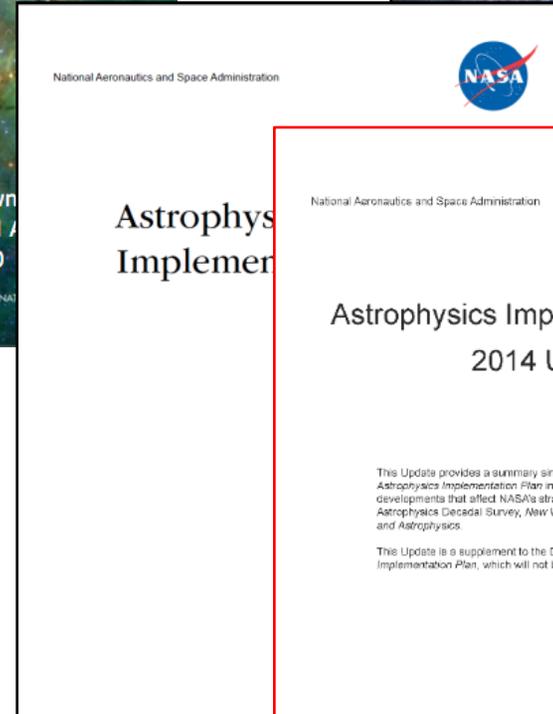
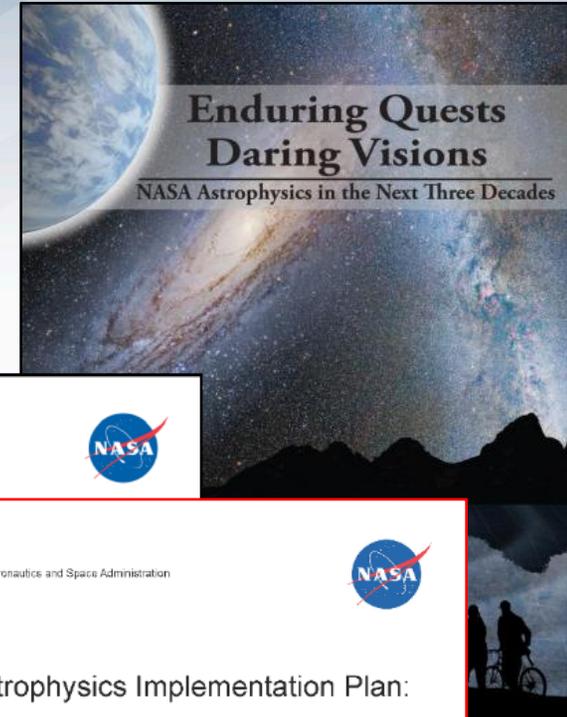
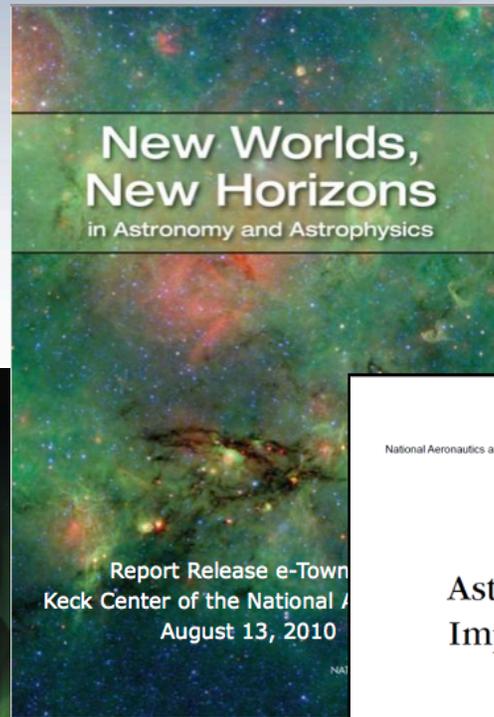
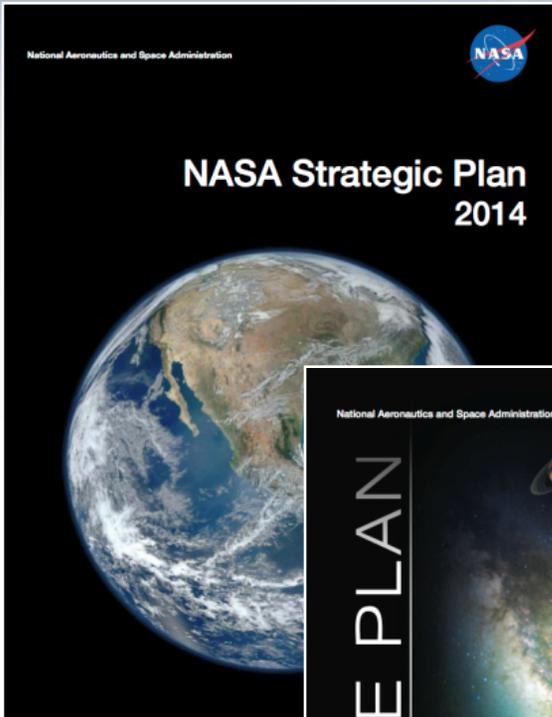


2001



2010

# Astrophysics Driving Documents



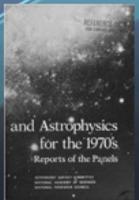
<http://science.nasa.gov/astrophysics/documents>



# ASTROPHYSICS

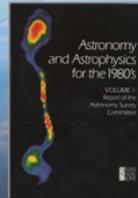
## Decadal Survey Missions

Launch 1990



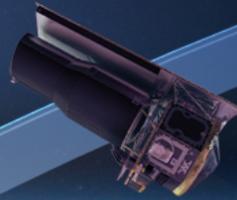
**1972**  
Decadal Survey  
*Hubble*

Launch 1999



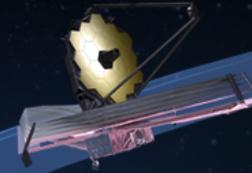
**1982**  
Decadal Survey  
*Chandra*

Launch 2003



**1991**  
Decadal Survey  
*Spitzer, SOFIA*

Launch 2018



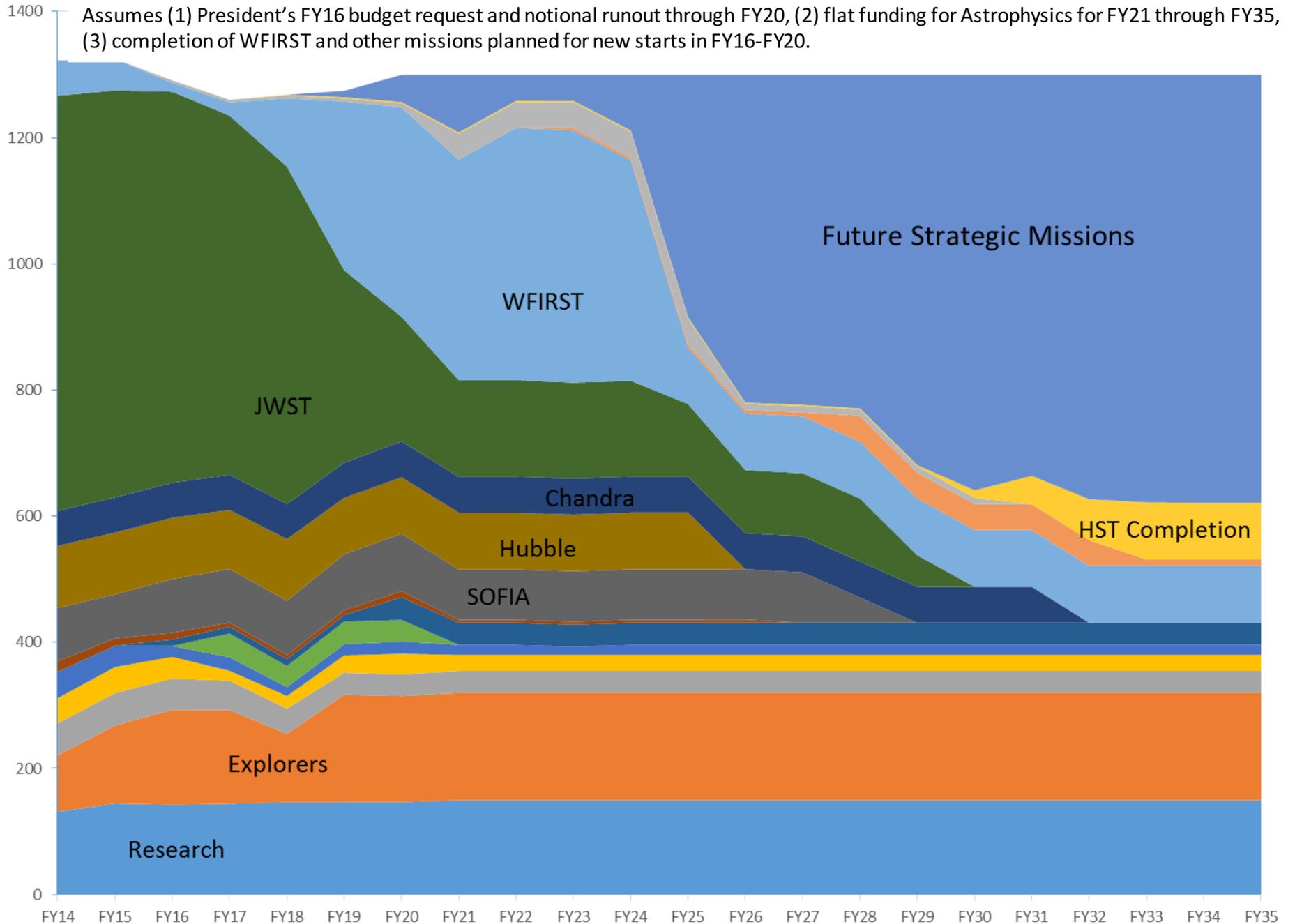
**2001**  
Decadal Survey  
*JWST*

Launch mid-2020s

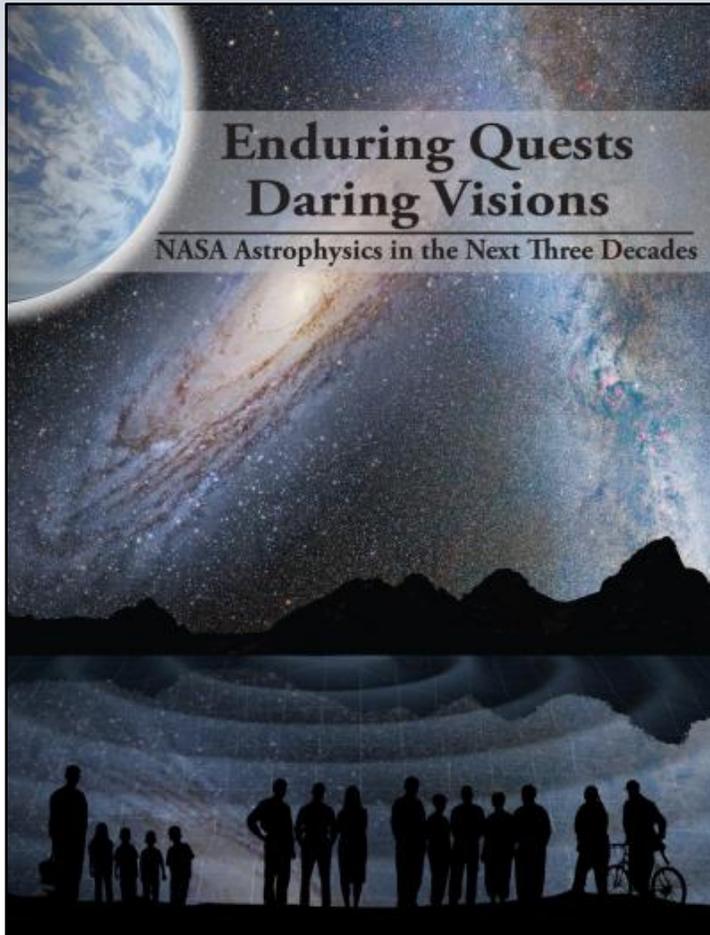


**2010**  
Decadal Survey  
*WFIRST*

# The Landscape after WFIRST (notional)



# A Community-driven Vision for the 2030s



- Far Infrared Surveyor
- Habitable Exoplanet Imaging Mission
- Large UV/Optical/Infrared Surveyor
- X-ray Surveyor

These four missions were endorsed by the Program Analysis Groups (PAGs) and recommended by the NAC's Astrophysics Subcommittee as the four mission concepts that NASA should study in preparation for the 2020 Decadal Survey.

# Preparing for the 2020 Decadal Survey Large Mission Concepts



NASA has assembled Science and Technology Definition Teams (STDTs) for each of the four large mission candidates to enable Mission Concept Studies as input to the 2020 Decadal Survey.

	Community STDT Chairs	Center Study Team	Study Lead Center	HQ Program Scientists
Far IR Surveyor	Asantha Cooray Margaret Meixner	David Leisawitz Ruth Carter	GSFC	Kartik Sheth Dominic Benford
Habitable Exoplanet Imaging Mission	Scott Gaudi Sara Seager	Bertrand Mennesson Keith Warfield	JPL	Martin Still Doug Hudgins
Large UV/Optical/IR Surveyor	Debra Fischer Bradley Peterson	Aki Roberge Julie Crooke	GSFC	Mario Perez Erin Smith
X-ray Surveyor	Feryal Ozel Alexey Vikhlinin	Jessica Gaskin Gregg Gelmis	MSFC	Dan Evans Lou Kaluzienski

<http://science.nasa.gov/astrophysics/2020-decadal-survey-planning/>

# Correcting Five Myths about the Large Mission Concept Studies



- This is not a competition and HQ will not select among the studies.
- This is not an AO proposal or a Phase A study.
- NASA will not build the design you come up with even if the Decadal Survey recommends your mission.
- A precise cost estimate is neither expected nor achievable.
- The Center and the Program Office are not in charge of the study; the Community Chairs are responsible for the final product.

# Success Criteria



NASA defines a successful outcome of these studies to be four compelling and executable mission concepts, which will subsequently be prioritized by the 2020 Decadal Survey.

**COMPELLING:** Worthy of a Decadal Survey recommendation (i.e., worth spending billions of \$\$ for the science return)

- Strong science motivation with well articulated objectives
- Groundbreaking science to be performed in the 2030s
- Synergies with existing/planned major ground- and space-based observatories

**EXECUTABLE:** Technically feasible with a believable path to technology maturation

- Architecture, mission design, + payload in the STDT report is notional.
- NASA has never launched the mission design that was specified in the Decadal Survey.
- Precise costing is neither expected or achievable.

# Science comes first



- First objective: A compelling science case for addressing critical science questions in the following decades
- Only then: The technical parameters necessary to achieve these goals, which will include:
  - Design Reference Mission, including notional payload.
  - Technology assessment.
  - Notional time to mature technology and develop mission.
- And at the very end: Cost assessment, major technical issues, and risk reduction plans as a function of science capability.

# A Community Driven Process



The Drivers  
**The Community  
Chairs**

**The STDT Members**  
Design the compelling  
science / technology case

The Liaison  
**Center Study  
Scientist**

The Engine  
**Center Study Team**  
Center Study Manager  
manages resources

# Interactions with NASA



- The Community Chairs are ultimately responsible for the delivery of a compelling and feasible mission concept. The Community Chairs and the Center Study Scientist interact directly with the HQ Program Scientists.
- The Program Scientists for your study are the Division Director's eyes and ears for this activity.
- The Center Study Manager leads the technical work in support of your study.
- The Program Offices facilitate the implementation of your study.
- The Management Plan is a work in progress. Changes will be made based on feedback from Study Teams and experience of the last few months.

■	Formulation
■	Implementation
■	Primary Ops
■	Extended Ops

Spitzer  
8/25/2003

Kepler  
3/7/2009

WFIRST  
Mid 2020s

LISA Pathfinder (ESA)  
12/3/2015

JWST  
2018

Euclid (ESA)  
2020

Chandra  
7/23/1999

XMM-Newton (ESA)  
12/10/1999

TESS  
2017

Swift  
11/20/2004

NuSTAR  
6/13/2012

**Your  
Mission  
Here**

Hitomi (JAXA)  
2/17/2016

Fermi  
6/11/2008

Hubble  
4/24/1990

CREAM (on ISS)  
2017

NICER (on ISS)  
2017

SOFIA  
Full Ops 5/2014

