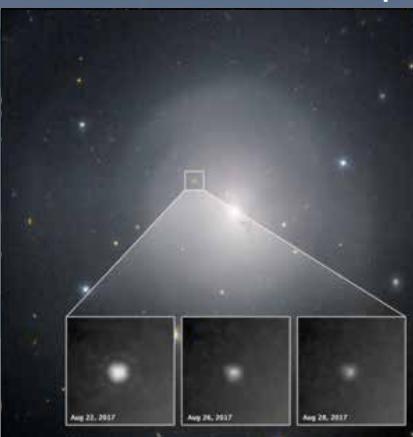
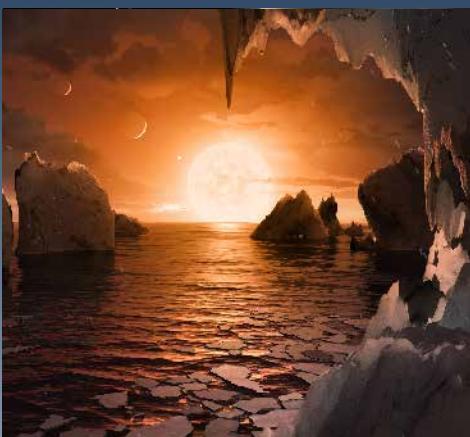
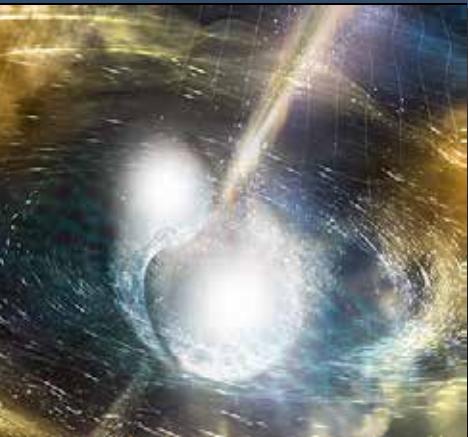




# Astrophysics



## NASA Town Hall Meeting

AAS 231st Meeting  
Washington, DC  
January 10, 2018

Thomas Zurbuchen

Dominic Benford  
Lucien Cox  
Daniel Evans  
Shahid Habib  
Jeffrey Hayes  
Patricia Knezek  
Mario Perez  
Rita Sambruna  
Linda Sparke

Paul Hertz

Felicia Chou  
Doris Daou  
John Gagosian  
Thomas Hams  
Stefan Immler  
William Latter  
Natasha Pinol  
Kartik Sheth  
Martin Still

V. Connaughton  
Jeanne Davis  
Michael Garcia  
Hashima Hasan  
John Karcz  
Michael New  
Christina Richey  
Eric Smith  
Eric Tollestrup

## Paul Hertz

Director, Astrophysics Division  
Science Mission Directorate

[@PHertzNASA](#)

This presentation is posted at  
<http://science.nasa.gov/astrophysics/documents/>

# Outline



Introductory Announcements	Charts 3-5
A Balanced Plan, a Strategic Vision	Charts 6-39
Big Picture	Charts 6-9
Operating missions deliver paradigm changing science	Charts 10-12
Large strategic missions are under development	Charts 13-20
High Explorers cadence has been resumed	Charts 21-25
International partnerships are extending opportunities	Charts 26-29
Investing in the community has been prioritized	Charts 30-36
Planning for the future is underway	Charts 37-39
Budget Update	Charts 40-43
A Balanced Plan, a Strategic Vision	Charts 44-45
Backups	Charts 46-51

# NASA HQ seeking Program Scientists



- Senior NASA scientists responsible for overseeing execution of missions, research, and strategic planning:
  - **Astrophysics:** Open to all areas of space-based astrophysics
  - Earth Science: Emphasis on Meteorology & Atmospheric Dynamics
  - Heliophysics: Open to all areas of space-based heliophysics
  - Planetary Science: Emphasis on Ocean Worlds
- AST, Science Program Management at NASA HQ
  - Salary Range: \$114,590 - \$164,200 (GS14 - GS15)
- Applications accepted only through [USAJobs.gov](#)
  - Schedule: Open January 2 to February 2, 2018
  - Interested scientists should familiarize themselves with [USAJobs.gov](#) and begin to develop their resume and application within the [USAJobs.gov](#) system
- To apply see: [USAJobs.gov](#)
  - NASA Announcement Number: HQ18D0004

<https://jobregister.aas.org/ad/806a2731>

<http://www.usajobs.gov/GetJob/ViewDetails/487663800>

# Visiting Program Scientists at NASA HQ



## Steward the US Space Astro Program

- Bring your unique experience and perspective to the HQ team and provide strategic advice toward meeting NASA's scientific goals.
- Help NASA maximize the scientific return from its missions and research programs.
- Provide key linkage to the astrophysics community and help guide the long term planning of the astrophysics program.

## What's in it for me? Become an expert in

- How science is enabled on the national and international stage.
- What makes a proposal successful for research programs and for missions / Explorers.
- Leading teams and multi-million dollar budgets.

**Have a tangible and visible impact on the science done by NASA and our community - you can make a difference!**

## What NASA is looking for

- Great team players & communicators.
- Ability to work on multiple programs & missions at the same time.
- Disciplinary expertise (e.g., data analysis, mission experience, theory, instrumentation).
- Ability to place knowledge in the broad context of US astrophysics.

## Next application opportunity: Fall 2018

- Only a CV + cover letter – rolling evaluations.
- Must have a long-term position at a US institution.
- Start date is flexible. Individual research time is negotiable. Position renewable for up to 6 years.
- For info, reach out to any HQ scientist or email Thomas Hams ([thomas.hams-1@nasa.gov](mailto:thomas.hams-1@nasa.gov)).

# NASA Astrophysics Diversity and Inclusion



- The NASA Astrophysics Division is actively taking steps to advance diversity, inclusion, and equal opportunity in the NASA workforce and among NASA grantee institutions.
- NASA Astrophysics is committed to:
  - Setting the expectancy of diversity and inclusion in the composition of: proposal teams, peer review panels, science and technology definition teams, and mission and instrument teams.
  - Promoting diversity on NASA-selected groups (e.g., advisory groups, peer review panels, science teams, etc.).
  - Recruiting a diverse Astrophysics Division staff.
  - Working with the NASA Office of the Chief Scientist and our peer review contractors to address unconscious bias in peer reviews.
  - Sharing best practices in peer reviews with other agencies.
  - Observing the demographics of R&A proposers and awardees as an indicator of issues.
- The demographics of R&A proposers and awardees – we notice that:
  - The inferred gender balance of awardees does reflect that of proposers.
  - The inferred gender balance of proposers does not always reflect that of the community.



# NASA Astrophysics

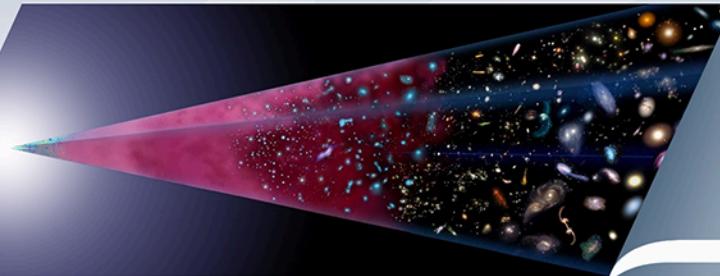
**A Balanced Plan  
A Strategic Vision**

# Why Astrophysics?

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



How did our universe begin and evolve?



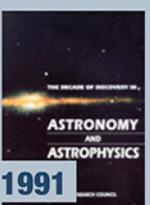
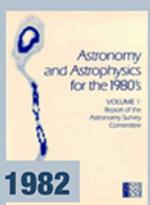
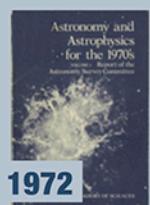
How did galaxies, stars, and planets come to be?



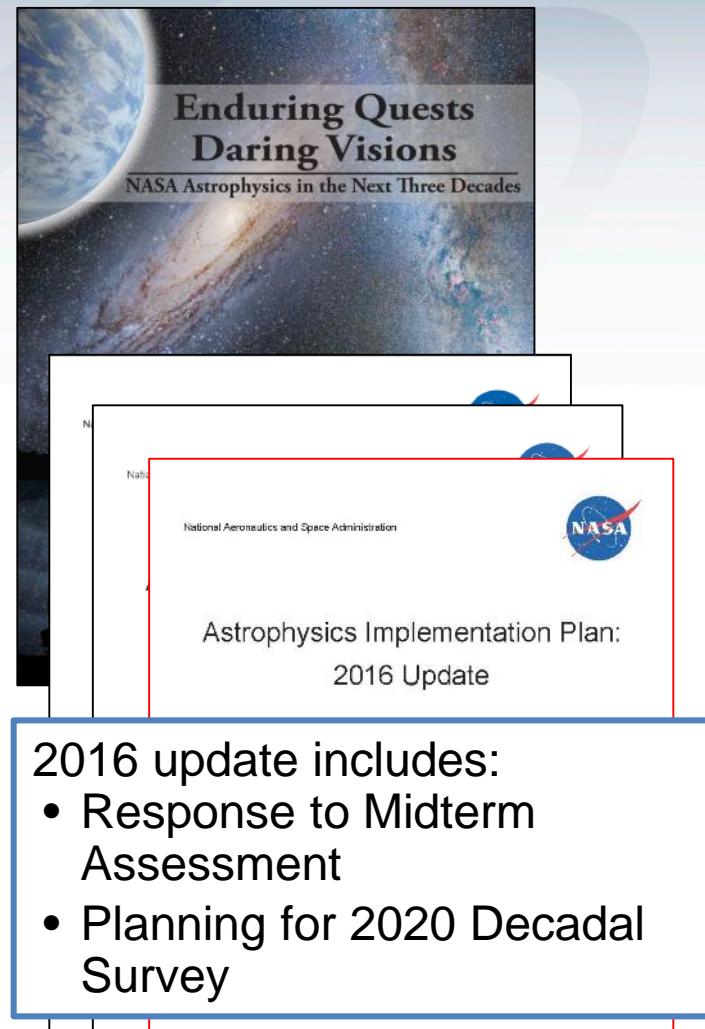
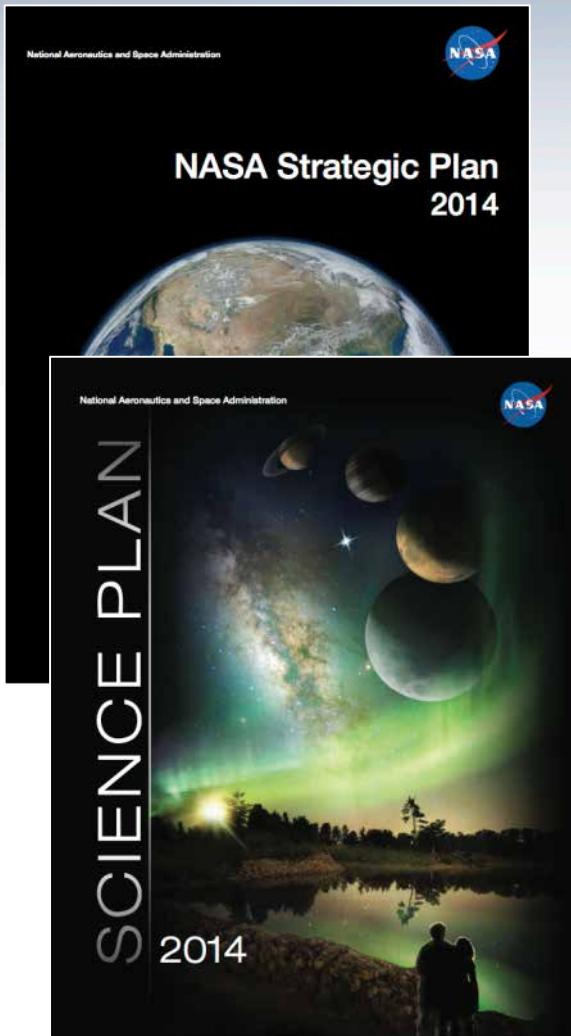
Are we alone?



Enduring National Strategic Drivers



# Astrophysics Strategic Planning



To be updated in 2018 (per GPRAMA)

December 15, 2016

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

# Astrophysics Big Picture



- The FY18 budget request would provide funding for NASA astrophysics to continue its planned programs, missions, projects, research, and technology.
  - Total requested funding for FY18 (Astrophysics including Webb) remains at ~\$1.35B.
  - The NASA Astrophysics FY18 budget request would fund Webb for a March – June 2019 launch, WFIRST formulation, Explorers mission development, increased funding for R&A, continued operating missions, suborbital missions, technology development, and mission studies.
  - FY18 President's Budget Request balances current science and future missions; Congressional markups, if enacted without additional funding, would put that balance at risk.
- NASA continues to prioritize implementation of the recommendations of the 2010 Decadal Survey.
  - National Academies' 2016 Midterm Assessment Report validates NASA's progress.
  - Webb making good progress toward launch.
  - WFIRST independent external Technical/Management/Cost review (WIETR) has led to direction to make design changes in WFIRST to stay within the \$3.2B cost target.
  - NASA is conducting large and medium mission concept studies for the 2020 Decadal Survey.

# **Current Program: an integrated strategic plan**



**We are executing a balanced strategic program for Astrophysics**

- Operating missions, large and small, continue to deliver paradigm changing science
  - See the many science results reported at this AAS meeting

# Astrophysics Missions in Operation

Hubble

NASA Strategic Mission

4/1990



Hubble Space Telescope

Chandra

NASA Strategic Mission

7/1999



XMM-Newton

ESA-led Mission

12/1999



Spitzer

NASA Strategic Mission

8/2003



Swift

11/2004

NASA MIDEX Mission



Swift Gamma-ray Burst Explorer

Fermi

NASA Strategic Mission

6/2008



X-ray Multi Mirror - Newton

Kepler

NASA Discovery Mission

3/2009

NuSTAR

NASA SMEX Mission

6/2012



SOFIA

5/2014

NASA Strategic Mission



Stratospheric Observatory  
for Infrared Astronomy

Fermi Gamma-ray  
Space Telescope

Kepler Space Telescope

ISS-CREAM

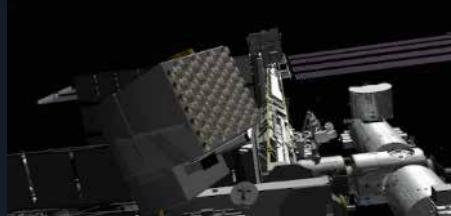
NASA Research Mission

8/2017

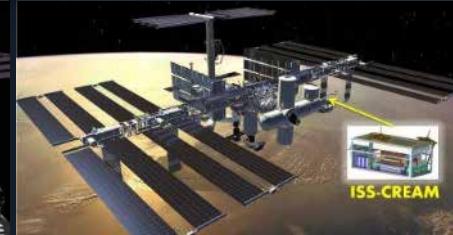
ISS-NICER

6/2017

NASA Explorers Mission of Opportunity

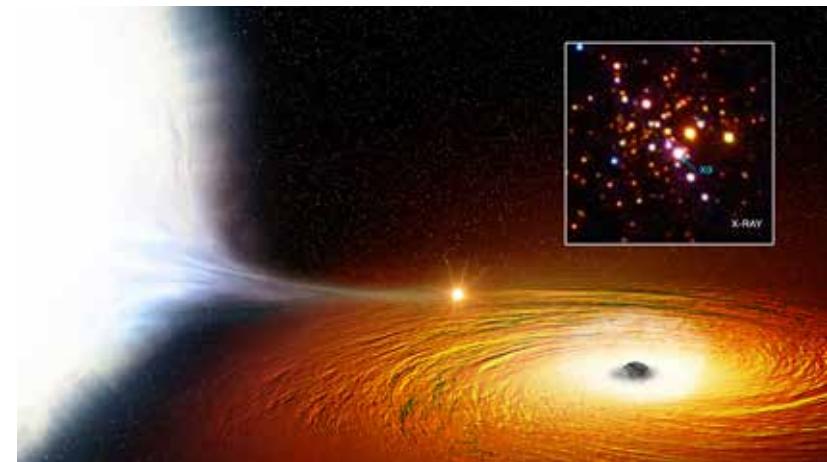
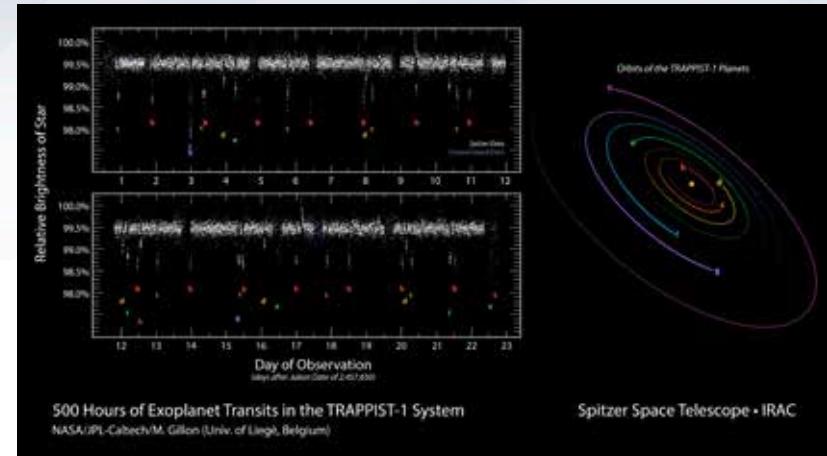
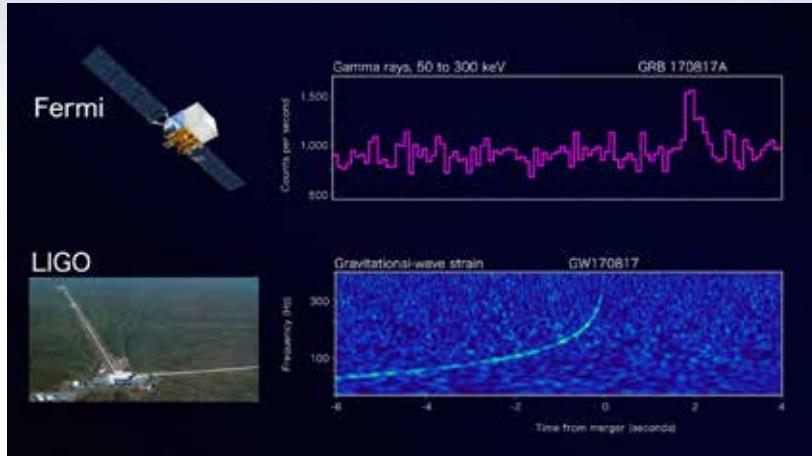


Neutron Star Interior  
Composition Explorer



Cosmic Ray Energetics  
And Mass

# Some NASA Science Stories of 2017



# Current Program: an integrated strategic plan

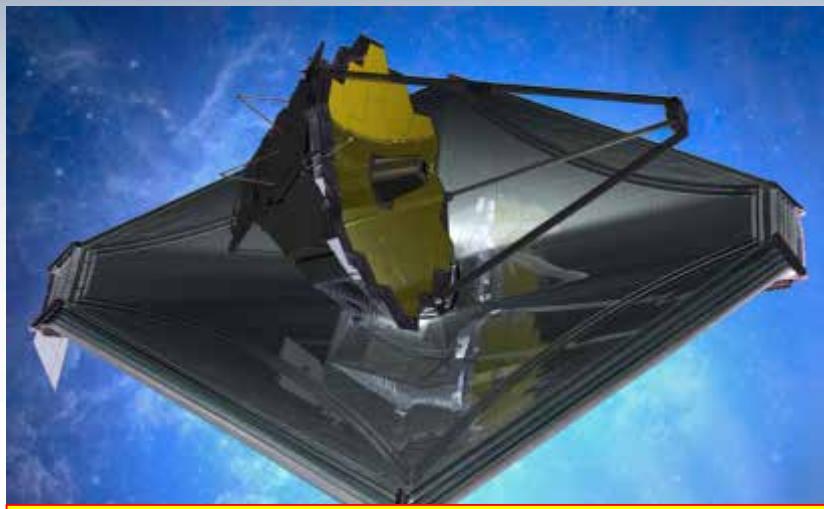


We are executing a balanced strategic program for Astrophysics

- Operating missions, large and small, continue to deliver paradigm changing science
  - See the many science results reported at this AAS meeting
- Large strategic missions under development ...
  - Are next generation great observatories
  - Will rewrite textbooks
  - Can only be done by NASA



# Webb James Webb Space Telescope



**Webb Town Hall: Tue @ 6:30 pm**

## Large Infrared Space Observatory

Top priority of 2000 Decadal Survey

**Science themes:** First Light; Assembly of Galaxies; Birth of Stars and Planetary Systems; Planetary Systems and the Origins of Life

**Mission:** 6.5m deployable, segmented telescope at L2, passively cooled to <50K behind a large, deployable sunshield

**Instruments:** Near IR Camera, Near IR Spectrograph, Mid IR Instrument, Near IR Imager and Slitless Spectrograph

**Operations:** 2019 launch for a 5-year prime mission

**Partners:** ESA, CSA

## 2017 Accomplishments

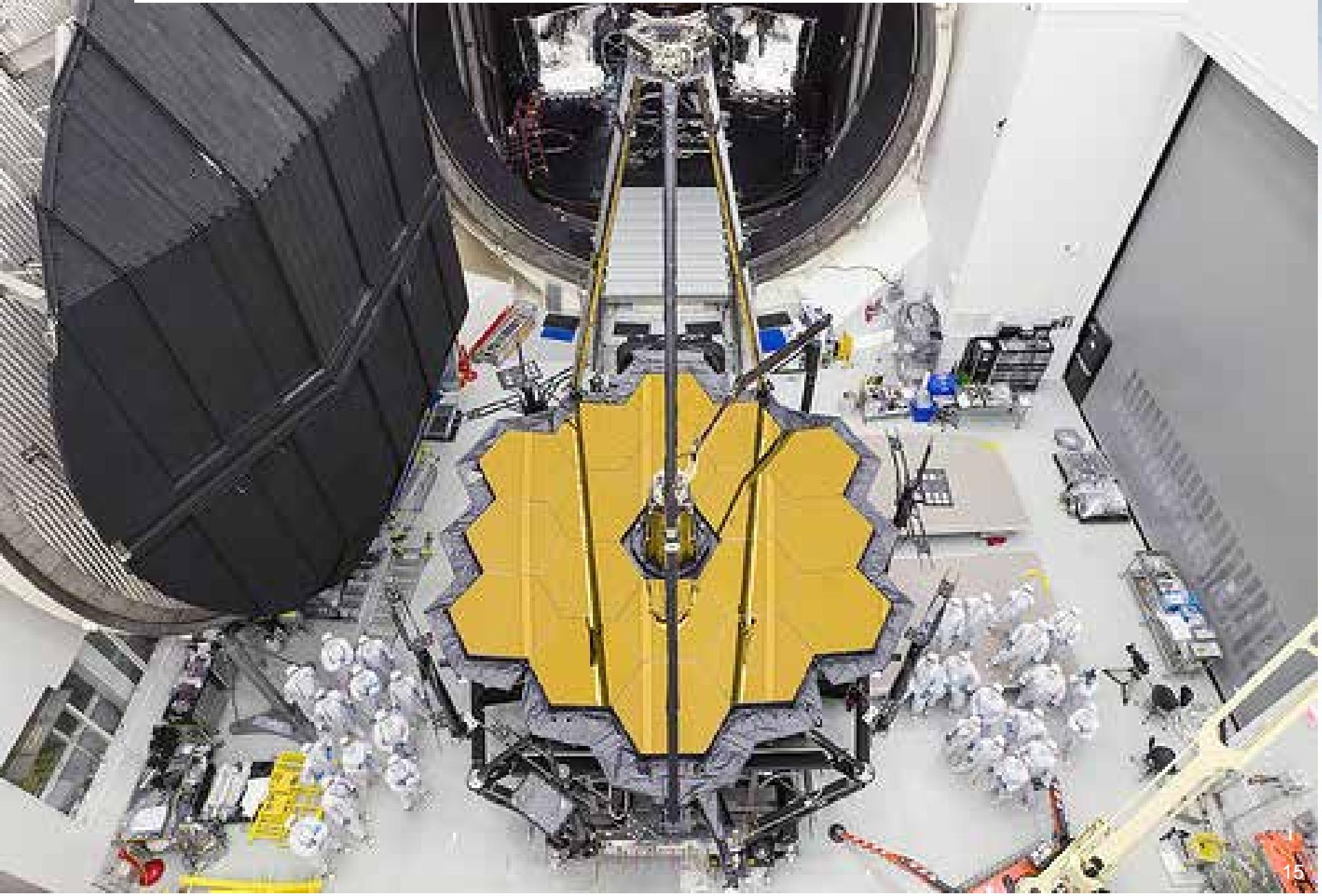
- Completed Science Payload vibration, and acoustics testing
- Solicited and selected Early Release Science proposals
- Received All Sunshield membranes
- **Completed cryovacuum testing of the science payload**
- **Integrated the sunshield and spacecraft forming the Spacecraft Element (SCE)**
- **Completed first flight hardware sunshield deployment test**

## 2018 Plans

- Complete Spacecraft Element testing
- Receive and Review Cycle 1 GO proposals
- Integrate the Science Payload to the SCE, forming the Observatory
- Begin testing the Observatory

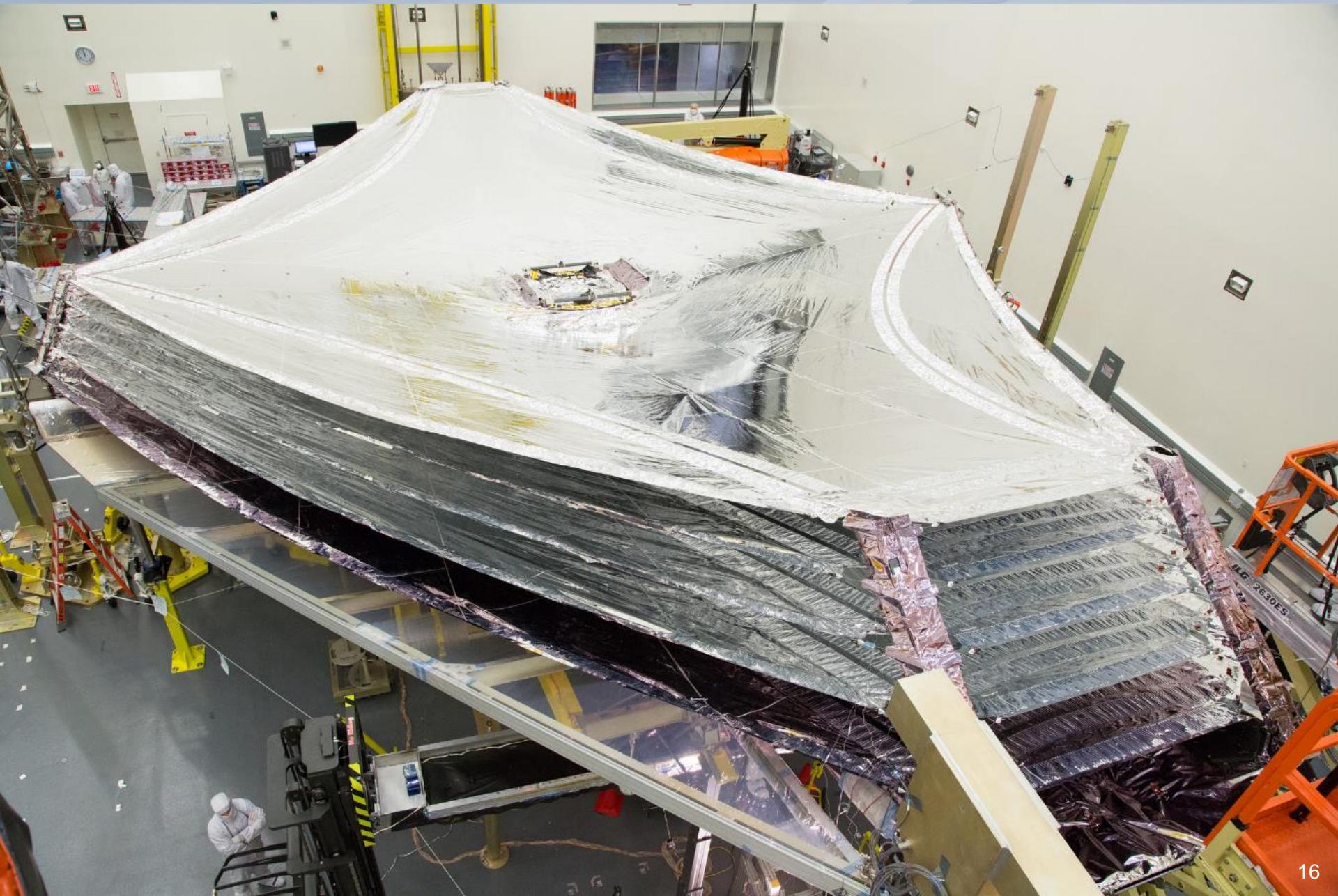
**Webb remains within its replan budget guidelines**

# Webb OTIS after Thermal Vacuum Testing



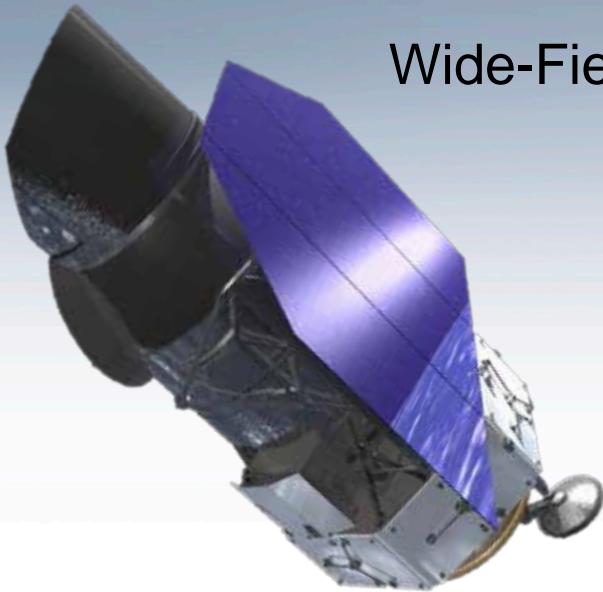


# Webb Sunshield Deployed



# Webb Spacecraft and Sunshield Buildup





### CURRENT STATUS:

- Completed three-year technology development activities on WFIRST's two critical mission technologies (near infrared detectors and coronagraph technologies)
- WFIRST Formulation Science Working Group and Science Investigation Teams selected
- Conducted WFIRST Independent External Technical/Cost/Management Review (WIETR) in response to findings and recommendations in National Academies' Midterm Assessment
- WFIRST directed by SMD AA to modify the current WFIRST design in order to reduce cost and complexity sufficient to have a cost estimate consistent with the \$3.2B cost target set at the beginning of Phase A.
  - Coronagraph is technology demonstration instrument
  - An independent cost assessment will be conducted to validate the estimated cost as being consistent with the \$3.2B cost target.
  - SRR/MDR planned for February 2018.
  - KDP-B planned for March/April 2018.
- Jeff Kruk is Project Scientist following loss of Neil Gehrels

### Wide-Field Infrared Survey Telescope

Top priority of 2010 Decadal Survey

**Science themes:** Dark Energy, Exoplanets, Large Area Near Infrared Surveys

**Mission:** 2.4m widefield telescope at L2; using existing hardware, images  $0.28\text{deg}^2$  at  $0.8\text{-}2\mu\text{m}$

#### Instruments (design reference mission):

Wide Field Instrument (camera plus IFU), Coronagraph Instrument (imaging/IFS)

**Phase:** Currently in Formulation (Phase A)

>50 WFIRST Posters @ AAS Meeting  
WFIRST & Exoplanets, Wed @ 10:00 am  
WFIRST & Public Policy, Fri @ 10:00 am

<https://wfir.st.gsfc.nasa.gov/>

# WFIRST Direction Following WIETR Findings



<https://www.nasa.gov/feature/nasa-receives-findings-from-wfirst-independent-review-team>

- Goddard Space Flight Center to modify the WFIRST design to reduce cost and complexity to have a cost estimate consistent with the \$3.2B target set at the beginning of Phase A
- Basic architecture retained, including the existing widefield instrument, 2.4m telescope, and coronagraph instrument
- Reductions taken in widefield instrument and coronagraph instrument; coronagraph instrument treated as technology demonstration
- Cost of science investigations reduced
- Additional use of commercial subsystems for the spacecraft; serviceability for both the spacecraft and the payload retained
- Report the results of the re-scoping study at the System Requirements Review / Mission Design Review in February 2018, followed by independent cost assessment





# Approach to Re-scoping WFIRST

- Project estimate of cost to Science Mission Directorate has been reduced from ~\$3.6B to ~\$3.2B.
- Changes include the following (some cost up, most cost down):
  - Contribution to coronagraph technology demonstration instrument by NASA Space Technology Mission Directorate
  - Coronagraph Instrument treated as technology demonstration instrument
    - ✓ Fewer operation modes while retaining essential technology elements
    - ✓ Fewer science functions and no science pipeline
    - ✓ For coronagraph, shared risk Participating Scientist Program replaces GO Program
  - Reduced some Wide Field Instrument capabilities
    - ✓ Fewer operation and pipeline modes
    - ✓ Integral Field Channel contributed by international partners (NASA increase due to cost of accommodation)
    - ✓ Grism data pipeline contributed by international partner
    - ✓ Relaxed detector requirements increases yield during manufacture
  - Improved budget profile and accelerated schedule
    - ✓ Pulls in launch date 6 months
  - Additional mission risk reduction (sparing, testing, parts, etc.)

# Current Program: an integrated strategic plan



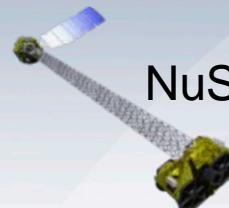
We are executing a balanced strategic program for Astrophysics

- Operating missions, large and small, continue to deliver paradigm changing science
  - See the many science results reported at this AAS meeting
- Large strategic missions under development ...
  - Are next generation great observatories
  - Will rewrite textbooks
  - Can only be done by NASA
- A high cadence of Explorers has been resumed

# Astrophysics Explorers Program



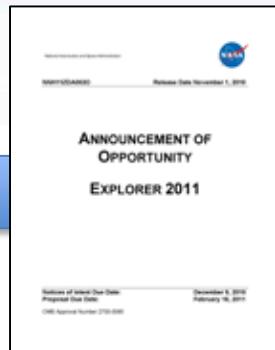
Swift



NuSTAR



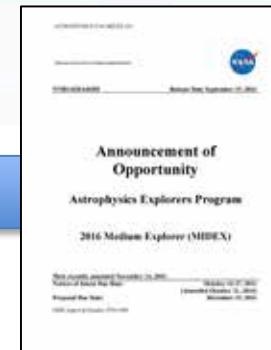
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ANNOUNCEMENT OF  
OPPORTUNITY  
EXPLORER 2011



Announcement of  
Opportunity  
Astrophysics Explorers Program  
2014 Small Explorer (SMEX)



Announcement of  
Opportunity  
Astrophysics Explorers Program  
2016 Medium Explorer (MIDEX)



Announcement of  
Opportunity  
Astrophysics Explorers Program  
2019 Small Explorer (SMEX)

MIDEX  
2011

SMEX  
2014

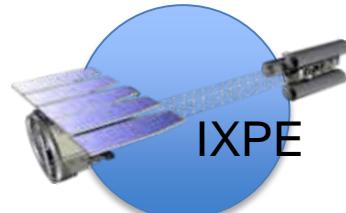
MIDEX  
2016

SMEX  
2019  
(planned)

Small and  
Mid-Size  
Missions



TESS



IXPE

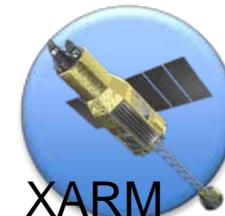


Directed  
2017

Missions of  
Opportunity



NICER



# TESS

## Transiting Exoplanet Survey Satellite



### Medium Explorer (MIDEX) Mission

PI: G. Ricker (MIT)

**Mission:** All-Sky photometric exoplanet mapping mission.

**Science goal:** Search for transiting exoplanets around the nearby, bright stars.

**Instruments:** Four wide field of view (24x24 degrees) CCD cameras with overlapping field of view, operating in the Visible-IR spectrum (0.6-1 micron).

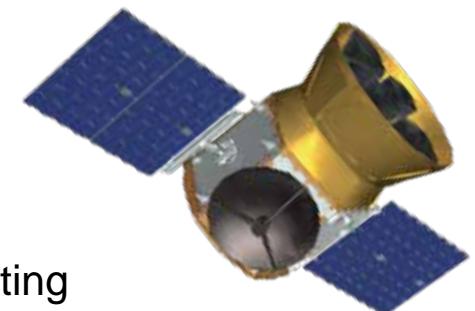
**Operations:** NLT June 2018 launch with a 3-year prime mission including 2 years of spacecraft operations and an additional 1 year ground-based observations and analysis. High-Earth elliptical orbit (17 x 58.7 Earth radii).

### CURRENT STATUS:

- Both instrument and spacecraft bus completed and integrated.
- Observatory environmental testing completed.
- Spare camera long-duration testing has shown no unexpected focus drift anomalies to date.
- Cycle 1 Guest Investigator proposals received October 6, 2017.

### SCHEDULE:

- ü July 2017 – SIR
- ü August 2017 – KDP-D
- ü Sept 2017 – PER
- ü October – Vibration testing
- ü November – TVAC testing



- Late Jan 2018 – Observatory I&T complete
- Early Feb 2018 – Delivery to KSC payload processing facility
- February 2018 – Selection of Cycle 1 GOs
- March 2018 – Launch readiness date from Cape Canaveral FL

<https://tess.gsfc.nasa.gov/>  
<https://tess.mit.edu/>

# Astrophysics Explorers in Competitive Phase A

## Arcus

PI: R. Smith/SAO



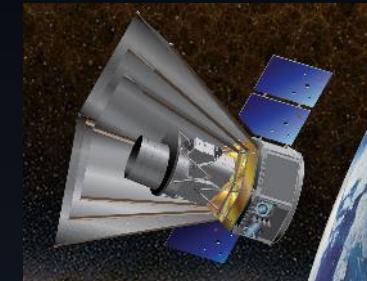
## FINESSE

PI: M. Swain/JPL



## SPHEREx

PI: J. Bock/Caltech



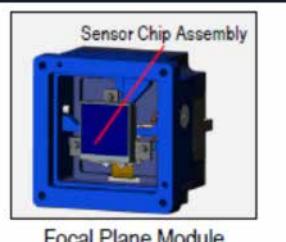
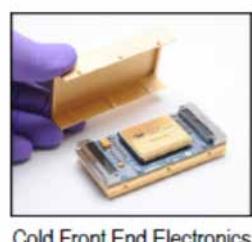
High resolution x-ray spectroscopy to explore the origin of galaxies

NIR transit spectroscopy to explore exoplanet atmospheres

NIR spectral survey addressing cosmology, galaxy evolution, and origin of ices

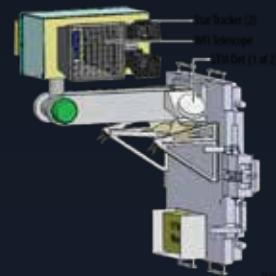
## CASE

PI: M. Swain/JPL



## COSI-X

PI: S. Boggs/UCB



Contribution of detectors to ESA's ARIEL

ULDB balloon mission to study origin of elements in the galaxy

All-sky x-ray survey to study transients and search for GW sources

# Current and Future Explorer AOs



- NASA is maintaining a cadence of 4 Astrophysics Explorers AOs per decade, as recommended by Decadal Survey and validated by Midterm Assessment.
  - Midterm Assessment Recommendation 4-3: “NASA’s Astrophysics Division should execute its current plan, as presented to the committee, of at least four Explorer Announcements of Opportunity during the 2012-2021 decade, each with a Mission of Opportunity call, and each followed by mission selection.”
- Most recent Astrophysics Explorers Program AO, released in September 2016, was for a MIDEX and Mission of Opportunity (MO).
  - Three MIDEX mission proposals and three Mission of Opportunity proposals selected in August 2017 for 9-month competitive Phase A studies
  - Down-selection: Early 2019 (target)
  - MIDEX launch readiness date no later than December 2023
  - MO launch readiness date no later than December 2022, except for Partner MOs whose launch date is set by the host mission.
- Next Astrophysics Explorers Program AO will be for a SMEX and MO and is targeted for release in 2019.
- Subsequent Astrophysics Explorers Program AO is for a MIDEX and MO and is targeted for release in late 2021.

# Current Program: an integrated strategic plan



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  - Are next generation great observatories
  - Will rewrite textbooks
  - Can only be done by NASA
- A high cadence of Explorers has been resumed
- International partnerships extend science opportunities for all

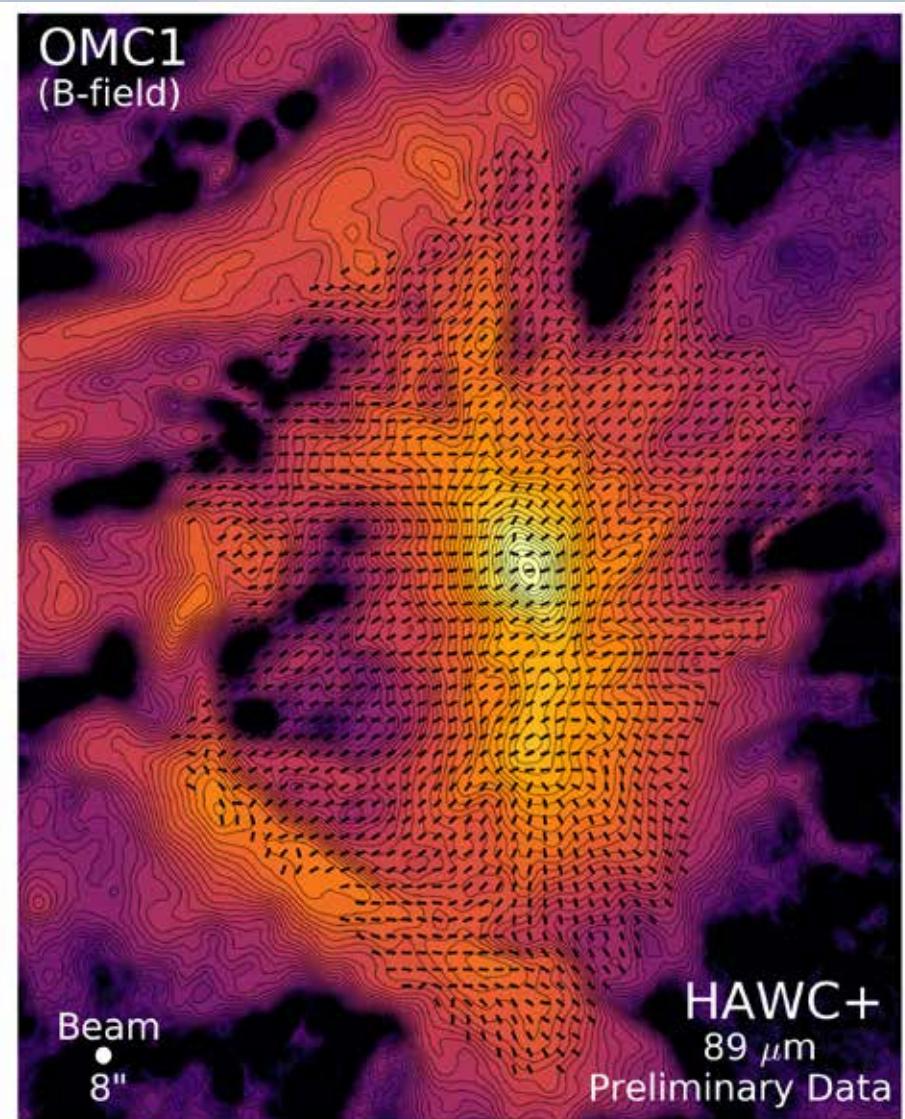
# SOFIA

## Stratospheric Observatory for Infrared Astronomy



- HAWC+ now in regular usage by GOs
- HIRMES instrument past CDR
- Next Gen instrument solicitation planned for January 2018

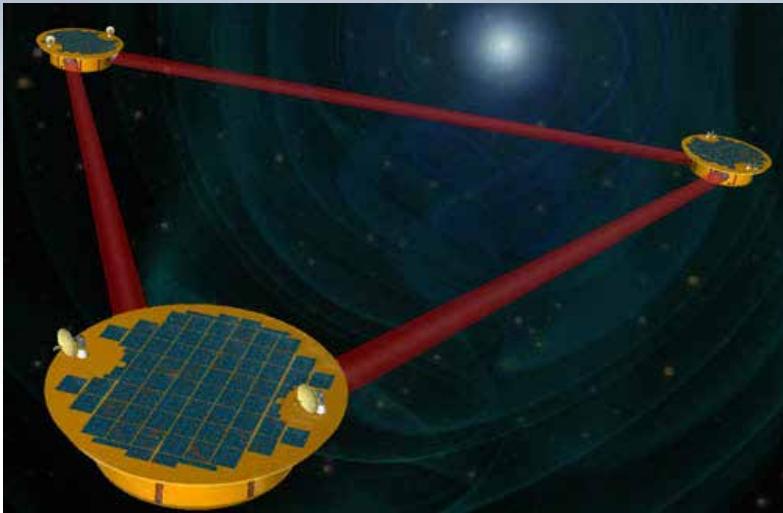
**SOFIA Townhall: Thursday @  
7:30 pm – 8:30 pm, Potomac D  
New Opportunities with SOFIA  
(science with new instruments, GO  
funding, new student programs)**



<https://www.sofia.usra.edu/>

# LISA

## Laser Interferometer Space Antenna



### Third ESA Cosmic Vision Large mission

- ESA mission with NASA participation
- Decadal Survey recommendation
- Space-based gravitational wave observatory

**Launch Date:** 2034

**Science Objective:** Study astrophysical phenomena and the universe using gravitational waves

### U.S.-based Technologies in Development:

- Lasers
- Telescopes
- Microthrusters
- Phasemeters
- Charge Management System

### CURRENT STATUS:

- Selected as Third ESA Cosmic Vision Large Mission in June 2017
  - Phase 0 ended December 2017
  - Phase A starts January 2018
- NASA has established a LISA Study Office at GSFC.
- NASA is funding five US-based technologies with the aim of reaching TRL 5/6 by Adoption (nominally 2022-2024).
- NASA and U.S. community participating in LISA Science Study Team and the LISA Consortium.
  - Kelly Holley-Bockelman (Vanderbilt), David Shoemaker (MIT), and Robin (Tuck) Stebbins (Colorado) are NASA nominated members to ESA LISA Science Study Team
- NASA established a NASA LISA Study Team to interface with NASA LISA Study Office, LISA Consortium, and Decadal Survey
  - Chair is Kelly Holley-Bockelman (Vanderbilt)

# LISA Preparatory Science



- The LISA Preparatory Science (LPS) is a new program element of ROSES-2018.
- The LPS Program will provide support for US investigators involved in analysis and interpretation of simulated LISA data.
  - It is **not** intended to support hardware work, which is funded separately, or to develop mission concepts.
- Proposals to the LPS Program may request support for:
  - Performing high-fidelity simulations of the expected waveforms for LISA sources;
  - Developing data analysis and statistical techniques useful for the extraction of scientific measurements from LISA data (e.g., parameter estimators, etc.);
  - Developing prototype data analysis tools, including innovative approaches to instrument simulation, that take into account the anticipated LISA mission performance;
  - Evaluating the capability of LISA data for enabling astrophysics investigations;
  - Conducting astrophysics investigations that prepare for the analysis and interpretation of the LISA data.
- Proposals will need to clarify how the proposed project fits in or augments ongoing efforts at the Study Office or in the LISA Consortium

# Current Program: an integrated strategic plan



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  - Can only be done by NASA
- A high cadence of Explorers has been resumed
- International partnerships extend science opportunities for all
- Investing in the community has been prioritized
  - R&A, technology development, supporting capabilities, ....

# Astrophysics Research Elements



## Supporting Research and Technology

- Astrophysics Research & Analysis (APRA)
- Strategic Astrophysics Technology (SAT)
- Astrophysics Theory Program (ATP)
- Theoretical and Computational Astrophysics Networks (TCAN)
- Exoplanet Research Program (XRP)
- Roman Technology Fellowships (RTF)
- System-Level Segmented Telescope Design

## Data Analysis

- Astrophysics Data Analysis (ADAP)
- GO/GI programs in ROSES for:
  - Fermi
  - Kepler/K2
  - Swift
  - NuSTAR
  - TESS
  - NICER (anticipated)

## Mission Science and Instrumentation

- SOFIA next-generation instrumentation
- Sounding rocket, balloon, cubesat, and ISS payloads through APRA
- XARM Participating Scientists
- LISA Preparatory Science (anticipated)

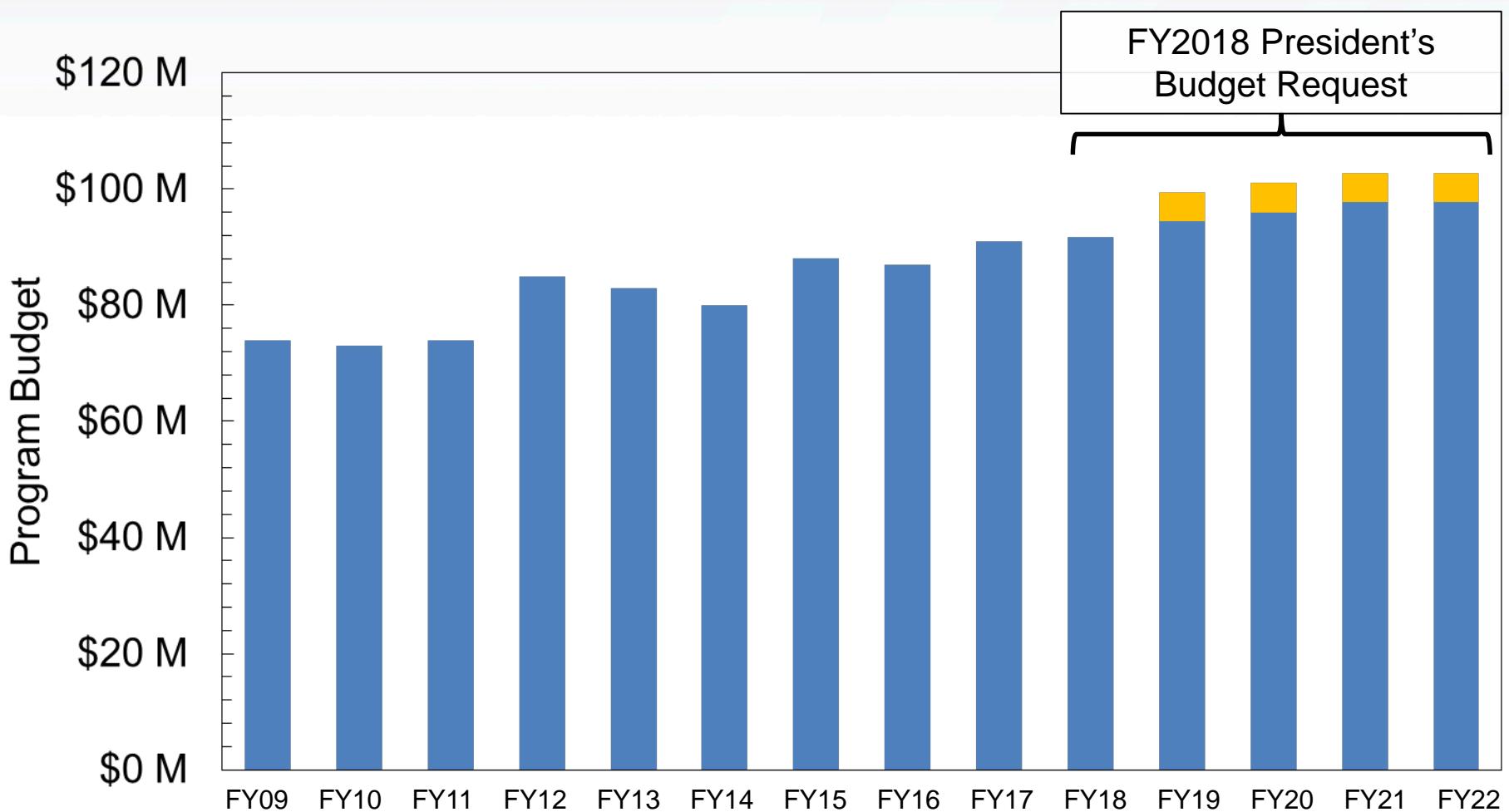
## Separately Solicited

- GO/GI/Archive/Theory programs for:
  - Chandra
  - Hubble
  - SOFIA
  - Spitzer
  - Webb
- Postdoctoral Fellowships (Einstein, Hubble, Sagan)
- Graduate Student Fellowships (NESSF)

# Growth in R&A Support



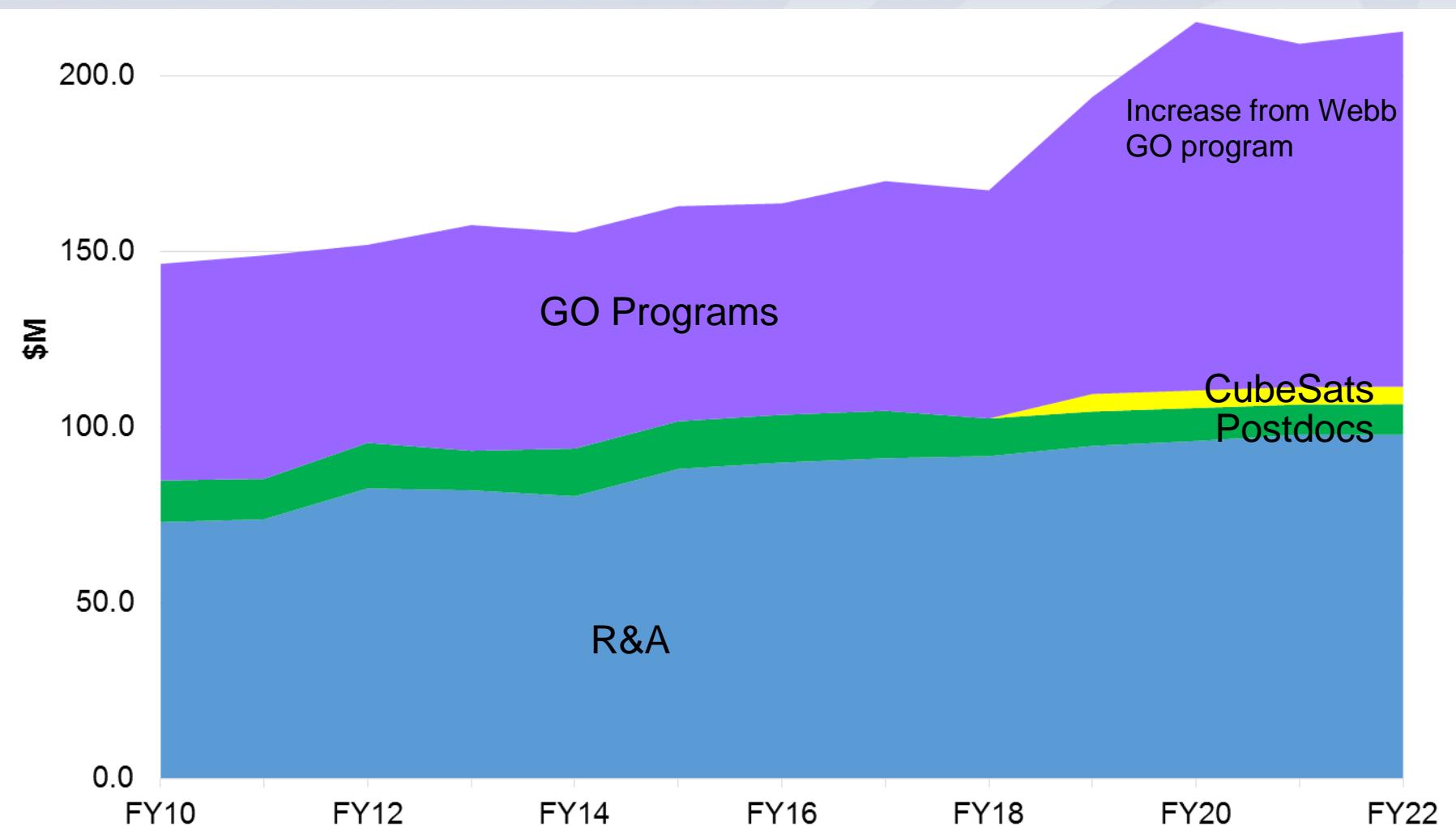
Program	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22
R&A	\$74 M	\$73 M	\$74 M	\$85 M	\$83 M	\$80 M	\$88 M	\$87 M	\$91 M	\$92 M	\$95 M	\$96 M	\$98 M	\$98 M
CubeSat											\$5 M	\$5 M	\$5 M	\$5 M
Total	\$74 M	\$73 M	\$74 M	\$85 M	\$83 M	\$80 M	\$88 M	\$87 M	\$91 M	\$92 M	\$100 M	\$101 M	\$103 M	\$103 M





# Growth in Total Community Support

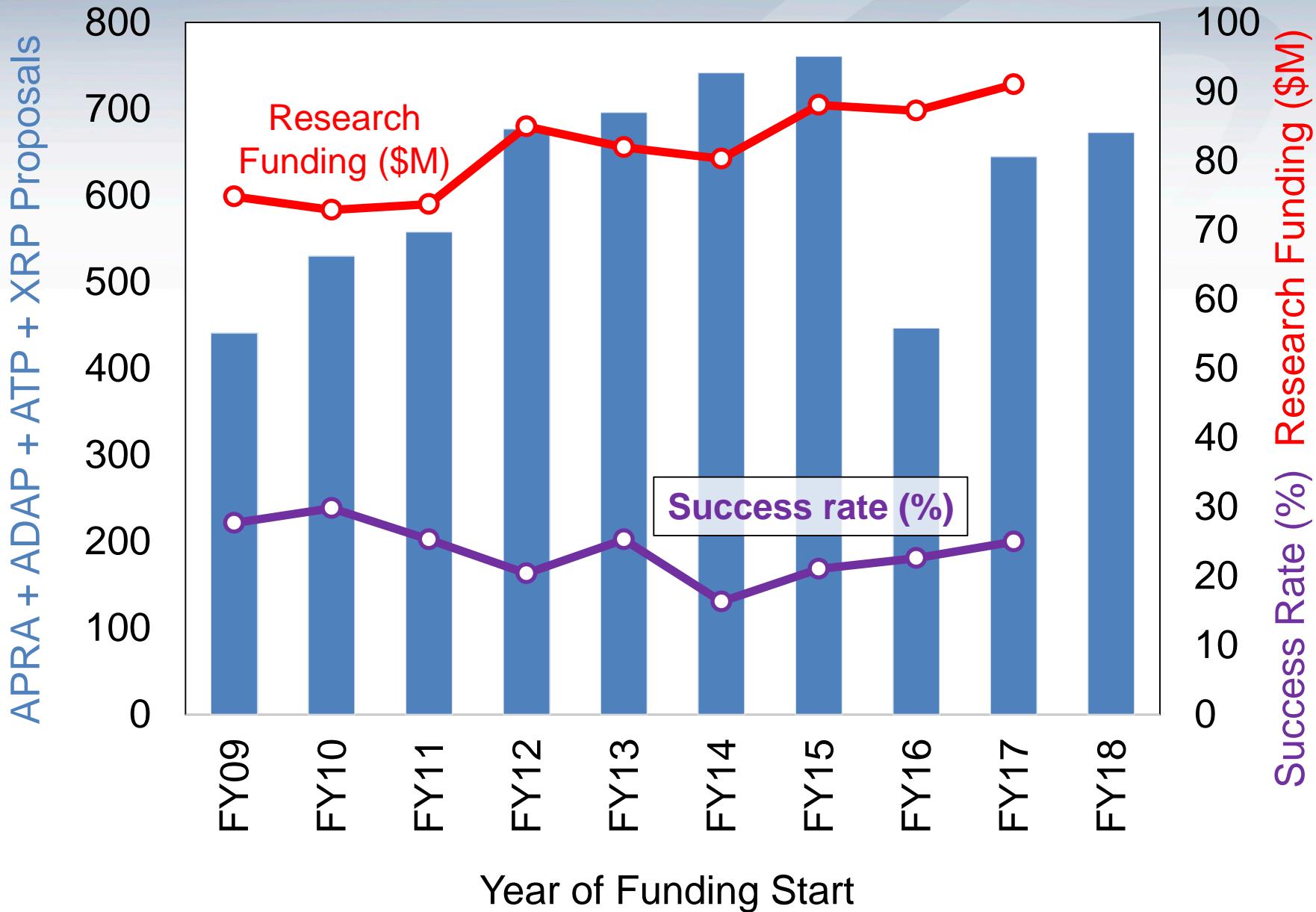
Does not include SAT or science teams for flight projects (e.g. Webb, WFIRST, Explorers)



GO programs funded from Chandra, Fermi, Hubble, Kepler/K2, NuSTAR, SOFIA, Spitzer, Swift, TESS, Webb, XARM, XMM; does not include possible extensions following the 2019 Senior Review.



# Proposal Pressure



# Look-ahead to R&A in 2018



- Introducing mandatory Notices of Intent to propose (NOIs) for Astrophysics R&A (APRA) and Strategic Astrophysics Technology (SAT)
  - Mandatory NOIs due January 25, 2018, for ROSES-17
- No Astrophysics Theory Program (ATP) solicitation in 2018
  - ATP solicitations are in alternate years
- New ROSES element for LISA Preparatory Science (LPS) planned
- New ROSES element for NICER GO program planned
  - After NICER completes prime mission
- Continue best practices in managing our R&A programs, reviews, and awards, including:
  - Actively taking steps to advance diversity, inclusion, and equal opportunity in the NASA workforce and among NASA grantee institutions
  - Planning to integrate results of high-risk/high-impact research review by advisory committees

# Upcoming Proposal Opportunities through April 2018



	Proposal Due Date	Reference
Habitable Worlds	January 17, 2018	ROSES-17 E.4
NuSTAR Guest Observer - Cycle 4	January 19, 2018	ROSES-17 D.10
Theoretical and Computational Astrophysics Networks (TCAN)	January 25, 2018	ROSES-17 D.12
System-Level Segmented Telescope Design	February 1, 2018	ROSES-17 D.15
NASA Earth and Space Science Fellowships (NESSF)	February 1, 2018	NSPIRES
Fermi Guest Investigator - Cycle 11	February 23, 2018	ROSES-17 D.6
Chandra General Observer - Cycle 20	March 15, 2018	cxc.harvard.edu
Roman Technology Fellowship	March 15, 2018	ROSES-17 D.9
Strategic Astrophysics Technology (SAT)	Mandatory NOI: Jan 25, 2018 Full proposal: March 15, 2018	ROSES-17 D.8
Astrophysics Research and Analysis (APRA)	Mandatory NOI: Jan 25, 2018 Full proposal: March 15, 2018	ROSES-17 D.3
Webb General Observer - Cycle 1	April 6, 2018	jwst.stsci.edu
Spitzer General Observer – Cycle 14	April 16, 2018	spitzer.caltech.edu
K2 Guest Observer – Cycle 6	April 19, 2018	ROSES-17 D.7
SOFIA Next-Generation Instrumentation	TBD	ROSES-17 D.13

# Current Program: an integrated strategic plan

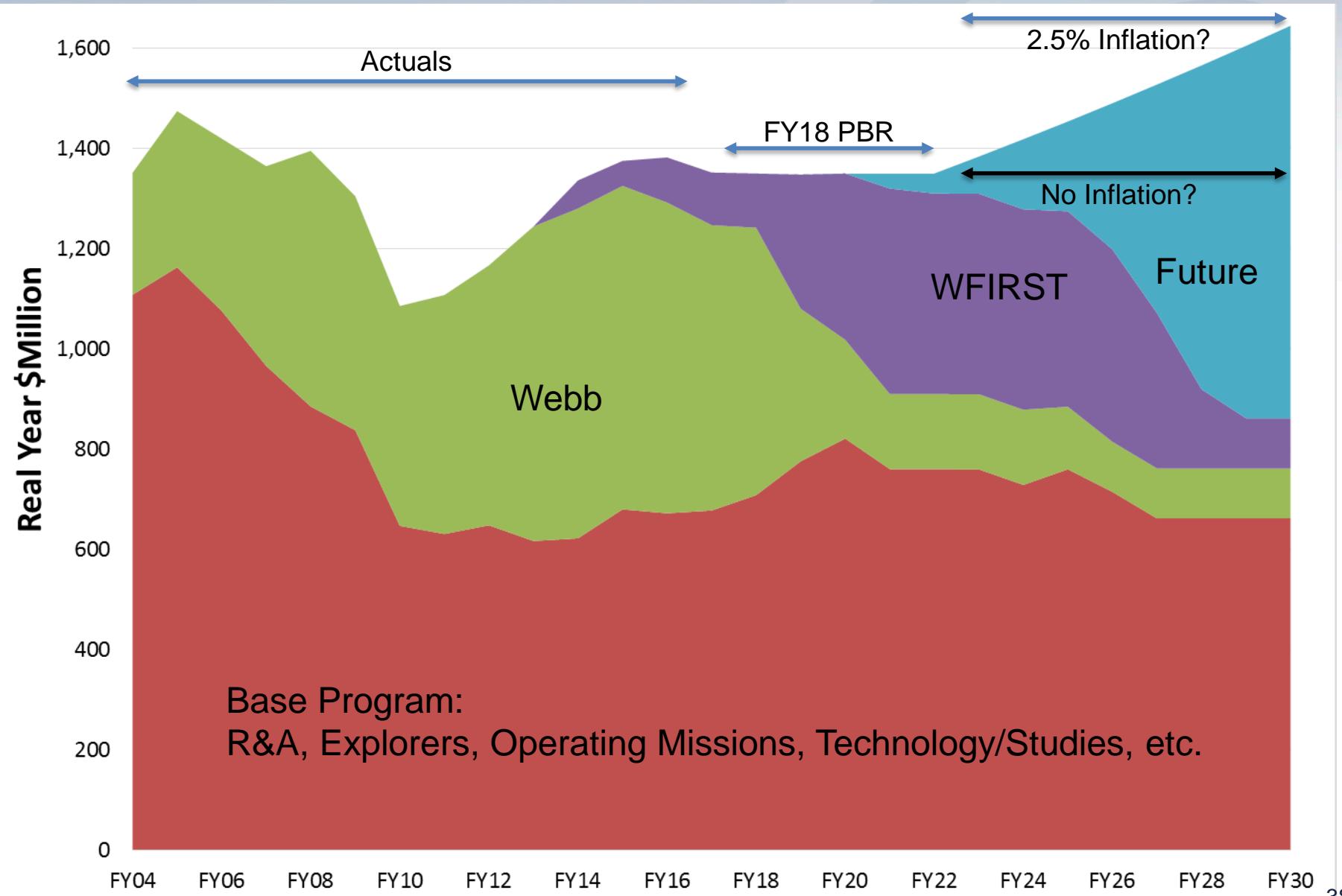


## We are executing a balanced strategic program for Astrophysics

- Operating missions, large and small, continue to deliver paradigm changing science
  - See the many science results reported at this AAS meeting
- Large strategic missions under development ...
  - Are next generation great observatories
  - Will rewrite textbooks
  - Can only be done by NASA
- A high cadence of Explorers has been resumed
- International partnerships extend science opportunities for all
- Investing in the community has been prioritized
  - R&A, technology development, supporting capabilities, ....
- Planning for the future is underway
  - Mission concept studies, technology investments



# Planning for the Future



# Preparing for the 2020 Decadal Survey



- Large Mission Concept Studies

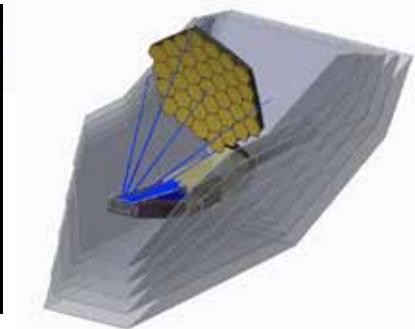
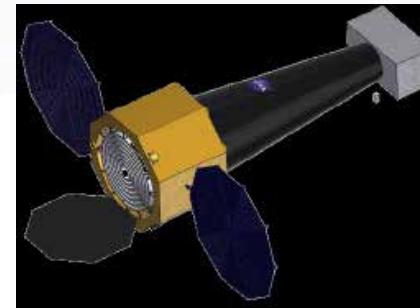
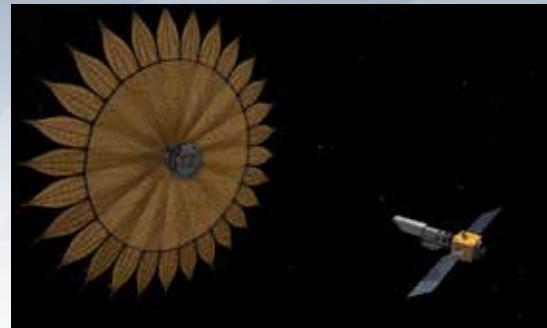


HabEx

LUVOIR

Lynx

OST



- Medium (Probe) Concept Studies

- Cosmic Dawn Intensity Mapper (A. Cooray)
- Cosmic Evolution through UV Spectroscopy Probe (W. Danchi)
- Galaxy Evolution Probe (J. Glenn)
- High Spatial Resolution X-ray Probe (R. Mushotzky)
- Inflation Probe (S. Hanany)
- Multi-Messenger Astrophysics Probe (A. Olinto)
- Precise Radial Velocity Observatory (P. Plavchan)
- Starshade Rendezvous Mission (S. Seager)
- Transient Astrophysics Probe (J. Camp)
- X-ray Timing and Spectroscopy Probe (P. Ray)



# **NASA Astrophysics**

## **Budget Update**



# Federal Budget Cycle

FY 2017	Negotiate Operating Plan	Execute Fiscal Year Budget																			
FY 2018	Negotiate & finalize budget proposal w/OMB via passback & appeals	Budget Release	• Budget Resolution • 302(a) & (b) alloc. • Hearings	Write, pass, and conference twelve appropriations bills	Negotiate Operating Plan	Execute Fiscal Year Budget															
FY 2019	Planning within Agency	Agencies receive strategic guidance from OMB			Agencies submit budget proposals	Negotiate & finalize budget proposal w/OMB via passback & appeals	Budget Release	• Budget Resolution • 302(a) & (b) alloc. • Hearings	Write, pass, and conference twelve appropriations bills	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep

Start of  
Calendar  
Year 2017

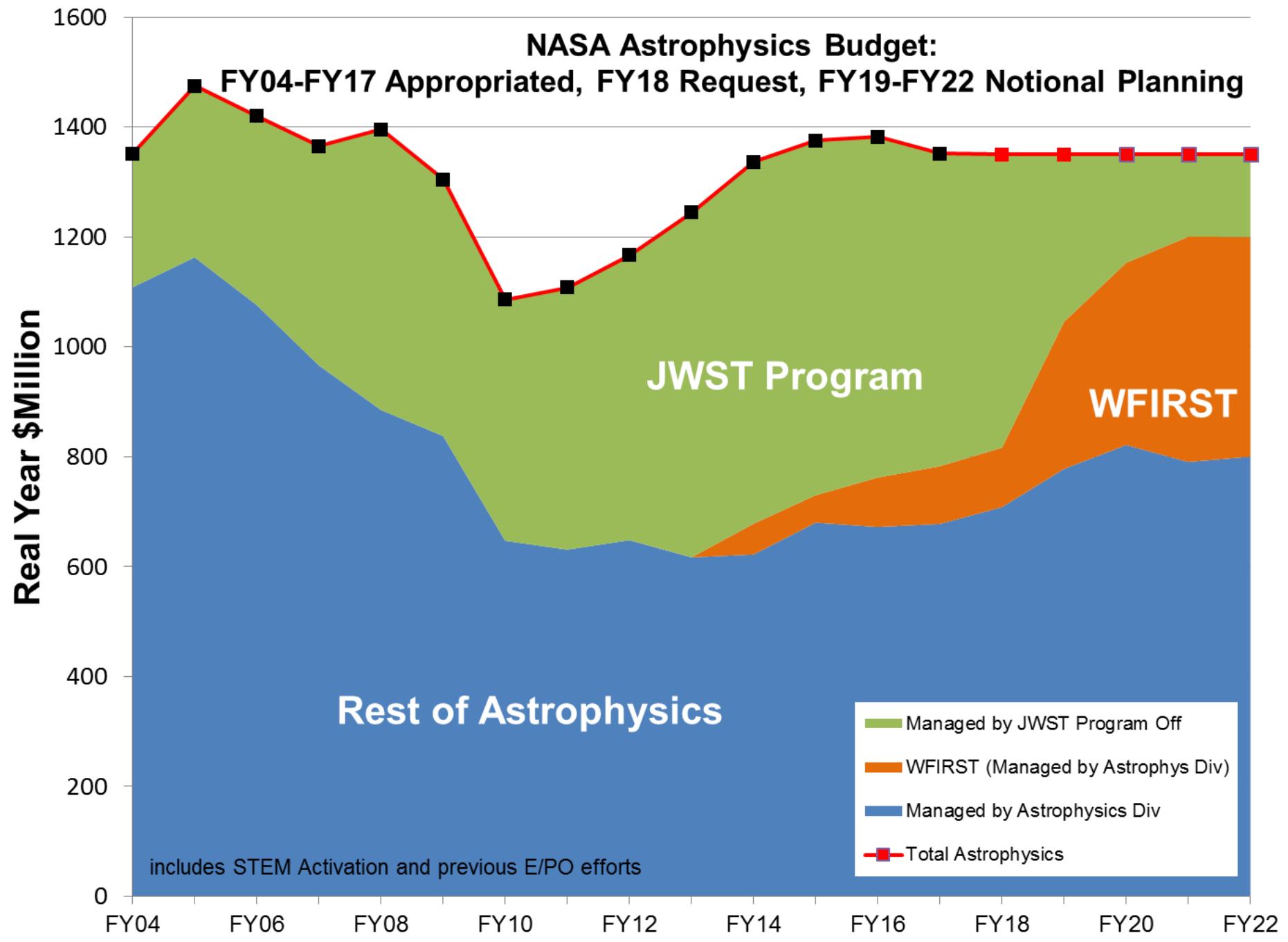


Start of  
Calendar  
Year 2018



We are here.  
Continuing resolution through January 19

Adapted by Kevin Marvel (AAS)  
[https://aas.org/files/budgetprocess\\_adaptedfromaaas.jpg](https://aas.org/files/budgetprocess_adaptedfromaaas.jpg)  
from budget presentation by Matt Hourihan (AAAS)  
<http://www.aaas.org/page/presentations>



# FY18 Appropriation Markups



- Both Markups

- Follow the Decadal Survey
- Webb must be \$533.7M (= requested) but do not overrun
- STEM Activation must be \$44.0M (= request); other language

- House Markup

- Core R&A must be \$74.1M (= request)
- SOFIA must be \$85.2M (+\$5.3M over request, = FY17 level); other language
- WFIRST must be \$126.6M (= request) but spend \$20M on starshade technology
- Language on high energy observatories, astrophysics probes, finding target(s) for interstellar probe

- Senate Markup

- WFIRST must be \$150.0M (+23.4M over request); review; data w/ Hubble, Webb
- Hubble must be \$98.3M (+\$15M over request)
- At least \$10M on “life detection technology”; consistent with request (maybe)

	FY18 PBR	FY18 Markups	
Total Astrophysics	\$ 1,350.5 M	\$ 1,350.5 M	
Line Item Projects	\$ 941.6 M	\$ 995.3 M	Webb, WFIRST, Hubble, SOFIA, R&A, STEM, “Life Detect Tech” *
Rest of Astrophysics	\$ 408.9 M	\$ 355.2 M	\$53.7M (13%) reduction

\* Combined House and Senate markups

# NASA Astrophysics: an integrated strategic plan



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- Operating missions, large and small, continue to deliver paradigm changing science
  - See the many science results reported at this AAS meeting
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- Planning for the future is underway
  - Mission concept studies, technology investments

- Formulation
- Implementation
- Primary Ops
- Extended Ops

+ MIDEX/MO (2023),  
SMEX/MO (2025), etc.



Spitzer  
8/25/2003

Kepler  
3/7/2009



Webb  
2019

WFIRST  
Mid 2020s



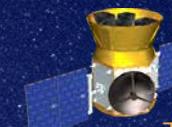
Euclid (ESA)  
2020



Chandra  
7/23/1999



XMM-Newton (ESA)  
12/10/1999



TESS  
2018



Swift  
11/20/2004

XARM (JAXA)  
2021

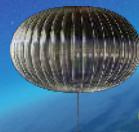
NuSTAR  
6/13/2012

Fermi  
6/11/2008

IXPE  
2021



Hubble  
4/24/1990



GUSTO  
2021



SOFIA  
Full Ops 5/2014

ISS-NICER  
6/3/2017



ISS-CREAM  
8/14/2017

+ Athena (late 2020s),  
LISA (mid 2030s)



# **NASA Astrophysics**

## **Backup**



# 231<sup>ST</sup> MEETING

AMERICAN ASTRONOMICAL SOCIETY  
WASHINGTON, DC • 8-12 JANUARY 2018



Photo Credit: www.suddath.com

## NASA-related events before the Town Hall

- Ø Webb Proposal Planning – Sun @ 8:30 am
- Ø Using Python to Search NASA's Archives – Sun, Mon
- Ø ExoPAG Meeting – Sun @ 2:00 pm
- Ø PhysPAG Gravitational Wave SIG – Mon @ 8:30 am
- Ø ExoPAG Meeting – Mon @ 9:00 am
- Ø COPAG Technology Interest Group – Mon @ 9:00 am
- Ø COPAG UV SIG – Mon @ 9:00 am
- Ø COPAG Cosmic Dawn SIG – Mon @ 10:30 am
- Ø PhysPAG X-ray SIG – Mon @ 10:45 am
- Ø PhysPAG Gamma-ray SIG – Mon @ 11:00 am
- Ø Joint PAG Meeting – Mon @ 1:30 pm
- Ø ExoPAG & COPAG Meeting – Mon @ 3:00 pm
- Ø PhysPAG – Mon @ 3:30 pm
- Ø NASA Decadal Prep: Probe Studies (posters) – Tue @ 9
- Ø COPAG Far-IR SIG - Tue @ 9:30 am
- Ø NICER Status and opportunities – Tue @ 10:00 am
- Ø NASA Decadal Prep I: Large Studies – Tue @ 10:00 am
- Ø Hubble's UV Initiative – Tue @ 10:00 am
- Ø Science of LUVOIR Mission Concept – Tue @ 2:00 pm
- Ø Learning with NASA Astrophysics – Tue @ 2:00 pm
- Ø NASA Decadal Prep II: Probes Studies – Tue @ 2:00 pm
- Ø Science of LUVOIR – Tue @ 2:00 pm
- Ø Webb Town Hall – Tue @ 6:30 pm
- Ø HabEx Town Hall – Tue @ 6:30 pm
- Ø K2 and TESS Opportunities – Tue @ 7:30 pm
- Ø Exoplanet Science with WFIRST – Wed, Jan 10 @ 10 am



# 231<sup>ST</sup> MEETING

AMERICAN ASTRONOMICAL SOCIETY  
WASHINGTON, DC • 8-12 JANUARY 2018



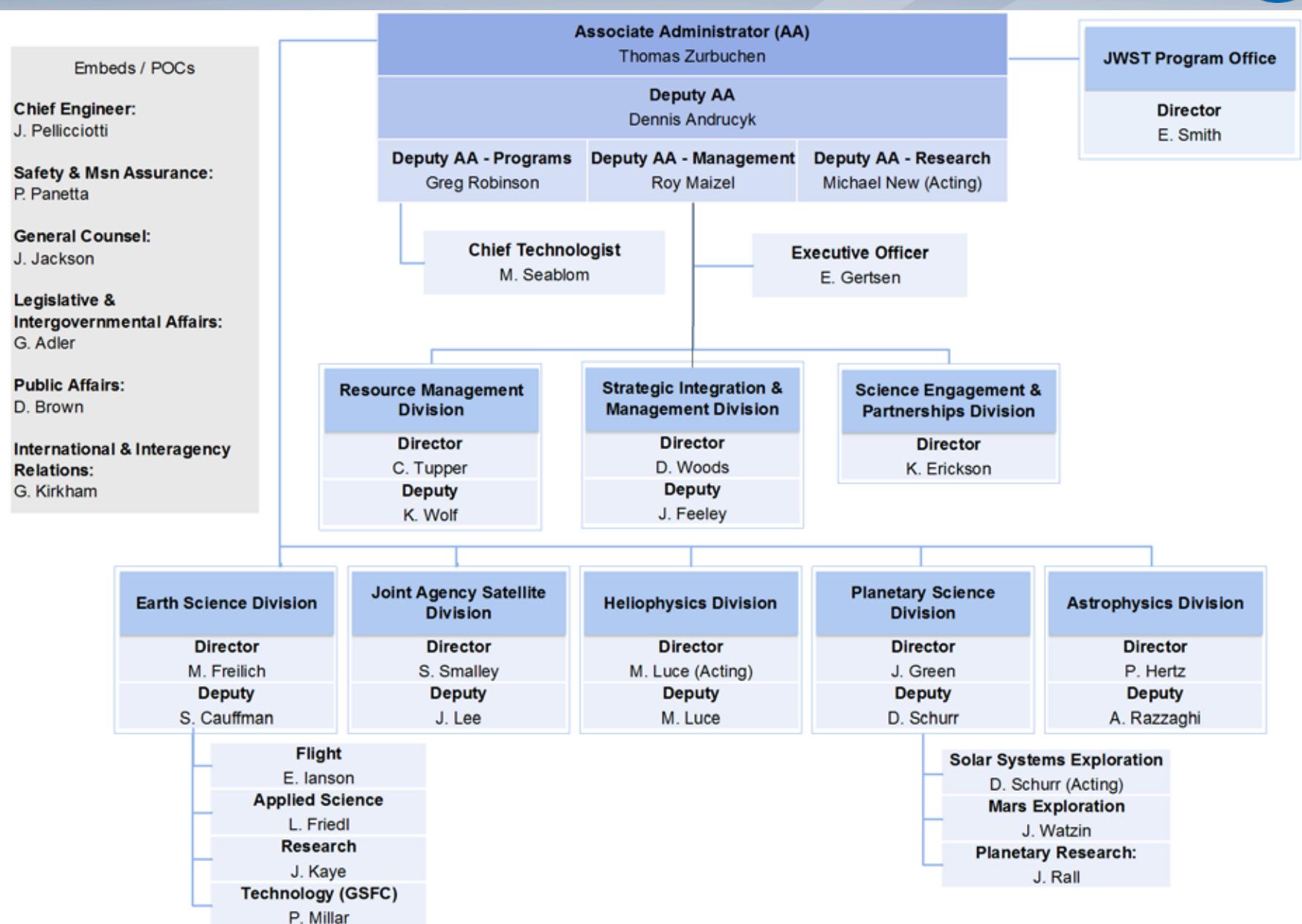
Photo Credit: www.suddath.com

## NASA-related events after the Town Hall

- Ø **NASA Town Hall - Wed @ 12:45 pm in Potomac Ballroom C**
- Ø Origins Space Telescope (OST) Meeting – Wed @ 1:30 pm in Chesapeake H
- Ø What Can I do with LUVOIR – Wed @ 2:00 pm in Chesapeake 7-8
- Ø Astrophysics with WFIRST – Wed @ 2:00 pm in National Harbor 6
- Ø Decadal Survey 2020 Town Hall – Wed @ 6:30 pm in Potomac Ballroom C
- Ø NASA Exoplanet Exploration Program Update – Thu @ 10:00 am in National Harbor 7
- Ø NASA Scientific Ballooning Town Hall – Thu @ 12:45 pm in Potomac Ballroom D
- Ø Ground Based Support for NASA Exoplanet Missions – Thu @ 2:00 pm in National Harbor 7
- Ø NASA Postdoctoral Program (NPP) Meet and Greet – Thu @ 7:30 pm in National Harbor 14
- Ø SOFIA Town Hall: New Opportunities – Thu @ 7:30 pm in Potomac Ballroom D
- Ø WFIRST Policy Panel – Fri @ 10:00 am in National Harbor 2



# SMD Organization Chart



# Astrophysics Division, NASA Science Mission Directorate

## Resource Management

Omana Cawthon+  
Clemencia Gallegos-Kelly+  
Debra McNeill+

**Director**  
Paul Hertz  
**Deputy Director**  
Andrea Razzaghi

**Lead Secretary:** Kelly Johnson  
**Secretary:** Kyle Nero  
**Program Support Specialist:** Jackie Mackall

## Cross Cutting

**Technology Lead:** Nasser Barghouty\*  
**Education POC:** Hashima Hasan (Lead Comm Team)  
**Public Affairs Lead:** Kartik Sheth  
**Information Manager:** Lisa Wainio\*  
**Strategic Planning:** Rita Sambruna

## Astrophysics Research

### Program Manager: Dan Evans

Program Support: Ingrid Farrell\*  
Astrophysics Data Analysis: Doug Hudgins  
Astrophysics Theory: Keith MacGregor\*  
Exoplanet Research: Martin Still\*  
APRA lead: Michael Garcia\*  
Cosmic Ray, Fund Physics: Thomas Hams\*, Vernon Jones,  
Keith MacGregor\*, Rita Sambruna  
Gamma Ray/X-ray: Valerie Connaughton\*, Dan Evans,  
Michael Garcia\*, Stefan Immler\*, Rita  
Sambruna  
Optical/Ultraviolet: Michael Garcia\*, Hashima Hasan, Patricia  
Knezek\*, Mario Perez\*, Martin Still\*  
IR/Submillimeter/Radio: Dominic Benford\*, Doug Hudgins,  
William Latter\*, Kartik Sheth, Eric  
Tollestrup\*  
Lab Astro: Doug Hudgins, William Latter\*  
Theory & Comp Astro Net: Keith MacGregor\*  
Roman Tech Fellows: Nasser Barghouty\*  
Data Archives: Hashima Hasan  
Astrophysics Sounding Rockets: Thomas Hams\*  
Balloons Program: Vernon Jones(PS), Mark Sistilli (PE)  
CREAM: Vernon Jones(PS), Jeff Hayes (PE)

**Director**  
Paul Hertz

**Deputy Director**  
Andrea Razzaghi

## Programs / Missions & Projects

### Program Scientist

### Program Executive

#### Strategic Astrophysics Mission

WFIRST                    **Dominic Benford\***  
Exoplanet Exploration (EXEP)                    **Doug Hudgins**  
Program                    Keck  
Keck                      Hashima Hasan  
Kepler/K2                Mario Perez\*  
LBTI                      Doug Hudgins  
NN-EXPLORE             Doug Hudgins

**John Gagosian**

**John Gagosian**

Mario Perez\*  
Jeff Hayes  
Mario Perez\*  
Mario Perez\*

#### Cosmic Origins (COR)

Program                    **Mario Perez\***  
Herschel                  Dominic Benford\*  
Hubble                    Michael Garcia\*  
SOFIA                    Kartik Sheth  
Spitzer                   Kartik Sheth  
Webb^                    Hashima Hasan

**Shahid Habib**

Jeff Hayes  
Jeff Hayes  
Lucien Cox\*  
Jeff Hayes  
N/A

#### Physics of the Cosmos (PCOS)

Program                    **Rita Sambruna**  
Athena                    Michael Garcia\*  
Chandra                  Stefan Immler\*  
Euclid                    Eric Tollestrup\*  
Fermi                    Stefan Immler\*  
LISA                      Rita Sambruna  
Planck                   Rita Sambruna  
ST-7/LPF               Rita Sambruna  
XMM-Newton             Stefan Immler\*

**Shahid Habib**

Shahib Habib  
Jeff Hayes  
Shahid Habib  
Jeff Hayes  
Shahid Habib  
Jeff Hayes  
Jeff Hayes  
Jeff Hayes  
Jeff Hayes

#### Astrophysics Explorers (APEX)

Program                    **Linda Sparke**  
GUSTO                   Thomas Hams\*  
IXPE                    Eric Tollestrup\*  
NICER                   Rita Sambruna  
NuSTAR                  Stefan Immler\*  
Swift                    Martin Still\*  
TESS                    Martin Still\*  
XARM                   Dan Evans

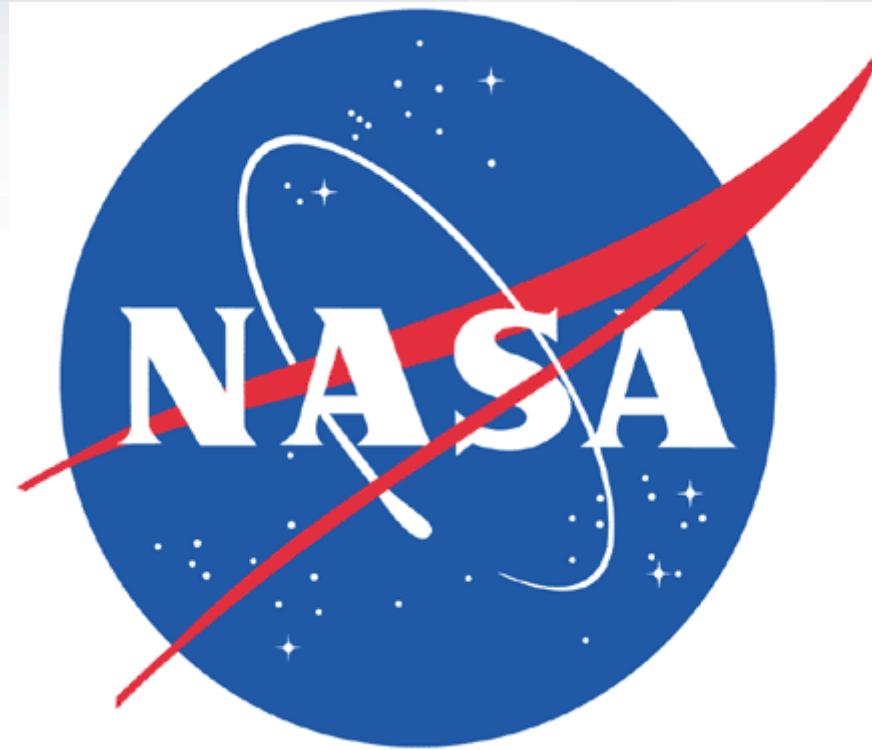
**Mark Sistilli**

Lucien Cox\*  
Mark Sistilli  
Jeff Hayes  
Jeff Hayes  
Jeff Hayes  
Jeff Hayes  
Mark Sistilli  
Shahid Habib

+ Member of the Resources Management Division

\* Detailee, IPA, or contractor

^ Webb is part of the JWST Program Office.



Astrophysics Division  
Science Mission Directorate  
National Aeronautics and Space Administration