

National Aeronautics and  
Space Administration



# EXPLORE SOLAR SYSTEM&BEYOND

## **NASA Astrophysics Update**

**HST STUC**

**October 8, 2021**

**Michael Garcia**

Hubble Program Scientist

Astrophysics Division, Science Mission Directorate

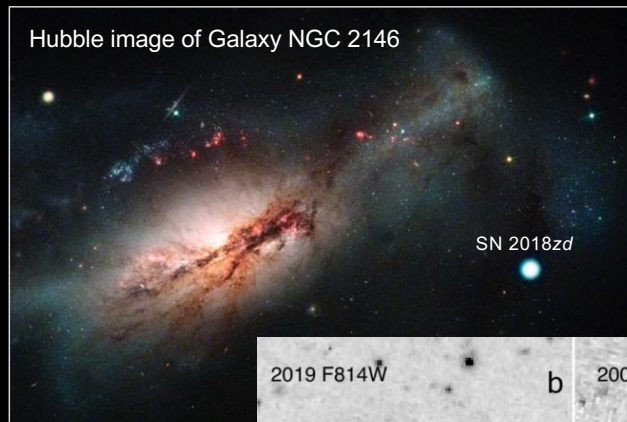
 [@NASAUniverse](https://twitter.com/NASAUniverse) [@NASAExoplanets](https://twitter.com/NASAExoplanets)

# Hubble Detects a New Type of Supernova

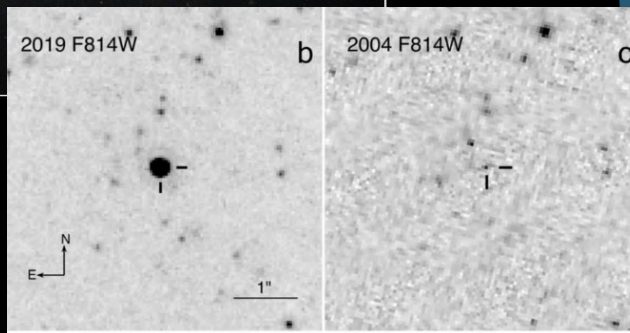
Released: June 28, 2021



SCIENCE  
HIGHLIGHT



Credits:  
NASA/STScI/  
J. DePasquale,  
S. Wilkinson, and  
Las Cumbres  
Observatory; and  
Nature Astronomy



Hubble images of star after (left) and before (right) the supernova explosion.

- Using data from the Hubble Space Telescope and the Neil Gehrels Swift Explorer, among many telescopes, scientists have identified for the first time a new, third type of supernova.
- The “electron capture” supernova explosion likely spawned from an intermediate mass red giant star 8-10 times the mass of the Sun.
- Instead of dying in superbright explosions like larger stars with an iron core, or like smaller white dwarf stars that accrete material from a companion, these intermediate mass stars spawn a lower energy explosion when electrons in the stellar core are “captured” by atoms like Mg and Ne, reducing electron pressure and creating instability.

Hiramatsu, D., Howell, D.A., Van Dyk, S.D. *et al. Nat Astron* **5**, 903 (2021)  
<https://doi.org/10.1038/s41550-021-01384-2>

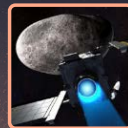




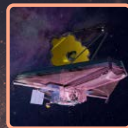
FBCE  
NG-16



LANDSAT 9



DART



WEBB



PEREGRINE-1



1<sup>ST</sup> NOVA-C



BIO EXP-1  
ARTEMIS 1



LUCY



IXPE



GOES-T



SOFIE  
SPX-23



TROPICS

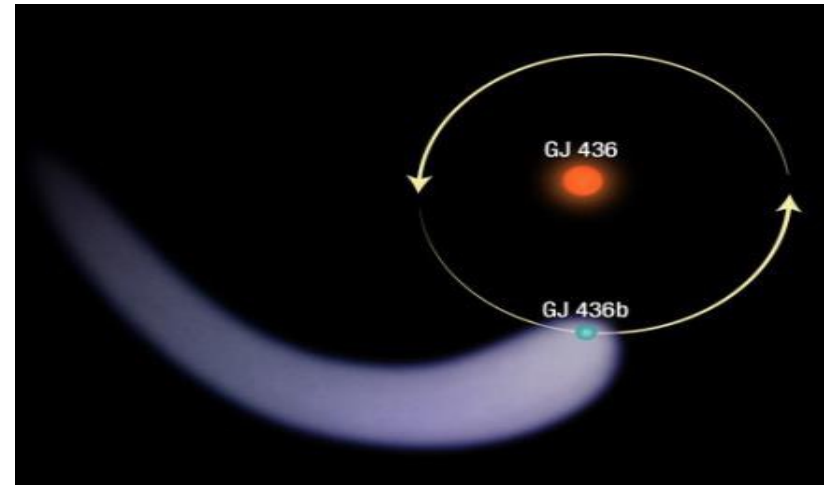
A YEAR OF SCIENCE

- LAUNCH
- DELIVERY
- LANDING
- DEPARTURE

# Colorado Ultraviolet Transit Experiment (CUTE)



Grad Student Arika Egan (center) and PM Nick DeCicco (left) insert CUTE in launch deployment canister at VAFB. Photo courtesy K. France



**Science Objectives:** The Colorado Ultraviolet Transit Experiment (CUTE) will take multiple medium resolution UV spectra of hot Jupiters during transit, in order to measure the composition of the atmosphere being ablated away. Magnetic fields may be detected via the presence of tori or bow shocks.

Launched Sep 27 as ride share with Landsat-9 primary payload

Sep 28 status: CUTE deployed, opened solar arrays, and communicated with the ground after launch

# Balloon Program

Campaigns cancelled due to COVID-19: Spring 2020 (New Zealand), Summer 2020 (Palestine TX), Fall 2020 (Ft Sumner NM), Winter 2020 (Antarctica), Spring 2021 (New Zealand), and Winter 2021 (Antarctica)

Successfully demonstrated Return to Flight using COVID-safe procedures with Spring 2021 (Ft Sumner NM) campaign

Ongoing Fall 2021 (Ft Sumner NM) campaign:

- ✓ WHATS UP (Water Hunting Advanced Terahertz Spectrometer on an Ultra Small Platform)/ Tang/JPL/Planetary Science (H/L) ✓ Aug 20
- ✓ SLS (Submm Wave Limb Sounder)/Stachnik/JPL/Earth Sci ✓ Aug 28
- ✓ CSBF Engineering Test Flight (6 technologies)/Salter/CSBF ✓ Aug 30
- ✓ CSBF Engineering test Flight (1 technology)/Mullenax/CSBF ✓ Sep 6
- ✓ HASP (High Altitude Student Platform)/Guzik/LSU/ Education ✓ Sep 14
- ✓ REMOTE/Toon/JPL/Earth Science ✓ Sep 25
- ✓ Orion Eagle/Nowicki/LANL/LANL Technology (H/L) ✓ Sep 26
- PICTURE C (Planetary Imaging Concept Testbed Using Recoverable Experiment)/Chakrabarti/UMASS/Astrophysics Next Year

Planning for CY2022 includes:

- Spring 2022 (New Zealand)
- Spring 2022 (Sweden)
- Fall 2022 (Ft Sumner NM)
- Winter 2022 (Antarctica)

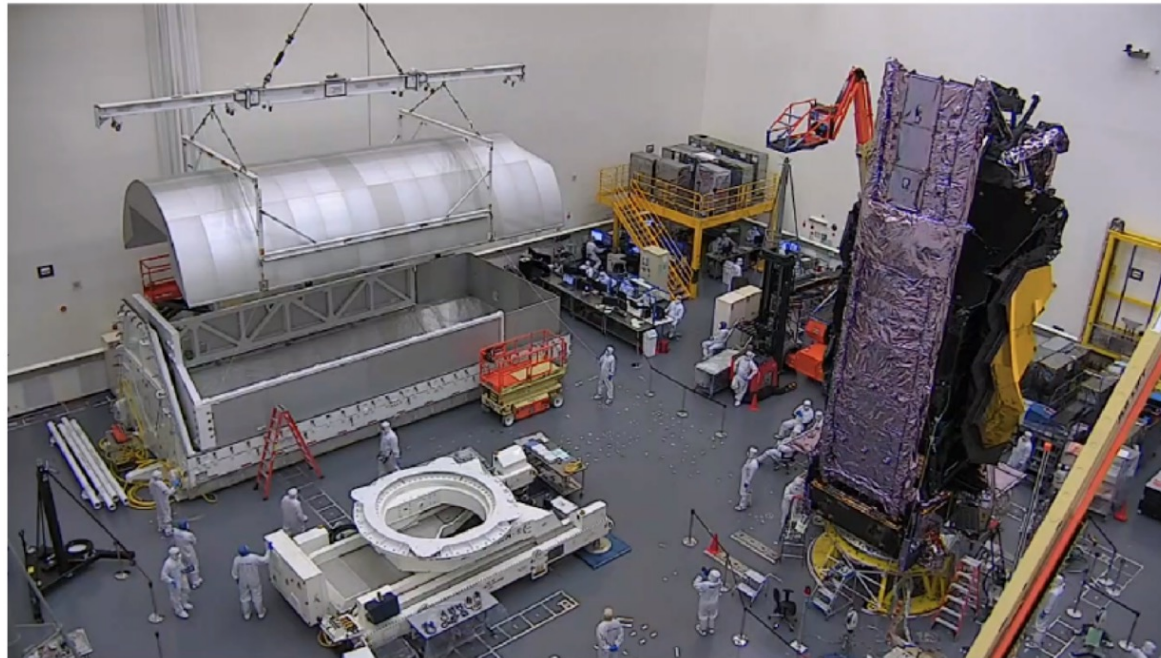
Fall 2021 Balloon  
Campaign is ongoing in  
Ft. Sumner, New Mexico







# James Webb Space Telescope



Update from  
Eric Smith  
AAAC Meeting Day 2

Shipping container, roll-over fixture and Webb at Northrop Grumman

[eric.p.smith@nasa.gov](mailto:eric.p.smith@nasa.gov)

September 2021 AAAC

**WEBB**  
SPACE TELESCOPE

# NANCY GRACE ROMAN SPACE TELESCOPE

Mission passed Critical Design Reviews for Telescope, Wide Field Instrument, Coronagraph Instrument, Instrument Carrier, Ground System during past year.

Completed the Critical Design Reviews for the spacecraft and the entire mission on 20-27 September 2021.

Project continues to make progress in spite of COVID inefficiencies and supply chain impacts; cost and schedule commitments have been adjusted to accommodate.

Opportunities for participation in Roman Space Telescope research and support are offered in ROSES-2021.

<https://roman.gsfc.nasa.gov/>

# Astrophysics FY22 Budget Request

**Requests \$1,575.5 M for NASA Astrophysics (including Webb) in FY 2022**

## **What's Changed compared to one year ago (previous budget request)**

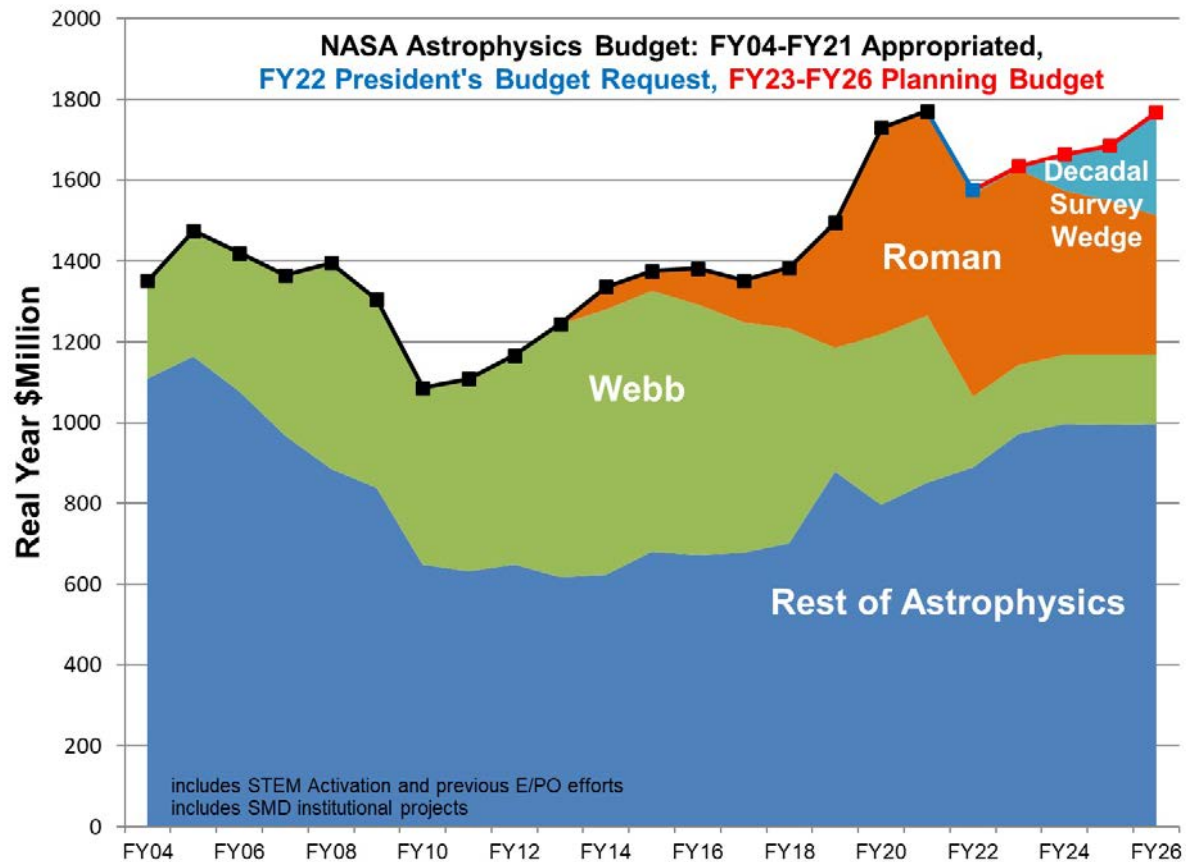
- Funds continued development of the Nancy Grace Roman Space Telescope and estimated COVID impacts
- Plans for an Astrophysics Probe-class mission and other initiatives pending receipt of the Decadal Survey
- Four Astrophysics Pioneers concluded mission concept studies
- Enhanced facilities and open science initiatives within research program (e.g., laboratory equipment upgrades, extreme precision radial velocity program, formulation for integrating data archives with cloud computing)
- Science activation increases to support diversity and inclusion initiatives
- Astrophysics Strategic Mission Program management funding to support the management of Roman and upcoming probe-class missions in recognition of the enhanced management requirements of these missions

## **What's the Same compared to one year ago (previous budget request)**

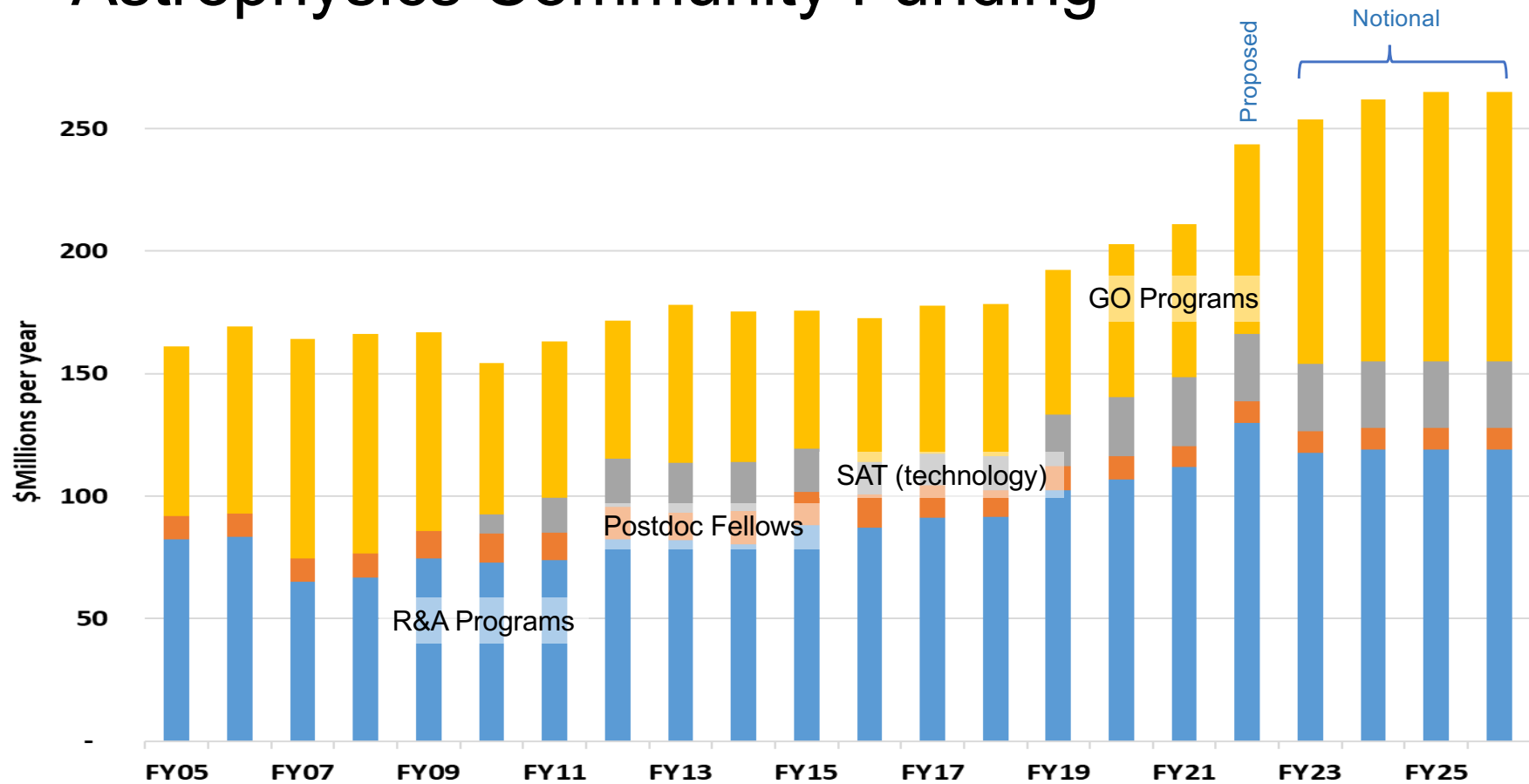
- Webb on track to launch in 2021
- Proposes termination of SOFIA due to its high cost and lower scientific productivity than other missions
- Hubble, Chandra, and other operating missions continue
- Supports development of IXPE, GUSTO, SPHEREx, and contributions to XRISM, Euclid, ARIEL
- Maintains Astrophysics Explorers cadence including both SMEX downselect and MIDEX AO in 2021
- CubeSat initiative and balloon campaigns within healthy research program



# Astrophysics Budget – FY22 Request



# Astrophysics Community Funding



National Aeronautics and Space Administration

## FY 2022 PRESIDENT'S BUDGET REQUEST SUMMARY

Budget Authority (\$ in millions)	Fiscal Year						
	Op Plan 2020	Enacted 2021	Request 2022	2023	2024	2025	2026
<b>James Webb Space Telescope</b>	<b>423.0</b>	<b>414.7</b>	<b>175.4</b>	<b>172.5</b>	<b>172.0</b>	<b>172.0</b>	<b>172.0</b>
<b>Astrophysics</b>	<b>1,306.2</b>	<b>1,356.2</b>	<b>1,400.2</b>	<b>1,461.8</b>	<b>1,491.5</b>	<b>1,512.3</b>	<b>1,594.1</b>
<b>Astrophysics Research</b>	<b>231.2</b>	<b>249.3</b>	<b>285.5</b>	<b>328.0</b>	<b>339.0</b>	<b>344.1</b>	<b>345.3</b>
Astrophysics Research and Analysis	86.6	91.1	107.4	94.9	95.2	95.2	95.2
Balloon Project	44.8	44.8	45.8	45.7	46.3	46.3	46.3
Science Activation	45.6	45.6	55.6	55.6	55.6	55.6	55.6
Other Missions and Data Analysis	54.3	67.8	76.7	131.8	141.9	147.0	148.2
<b>Cosmic Origins</b>	<b>202.7</b>	<b>203.8</b>	<b>115.0</b>	<b>126.3</b>	<b>114.7</b>	<b>115.1</b>	<b>126.9</b>
Hubble Space Telescope	90.8	93.3	98.3	98.3	98.3	98.3	98.3
Other Missions and Data Analysis	111.9	110.5	16.7	28.0	16.4	16.8	28.6
<b>Physics of the Cosmos</b>	<b>132.8</b>	<b>146.4</b>	<b>156.0</b>	<b>160.0</b>	<b>169.1</b>	<b>159.8</b>	<b>167.6</b>
<b>Exoplanet Exploration</b>	<b>554.2</b>	<b>552.4</b>	<b>543.3</b>	<b>547.6</b>	<b>525.8</b>	<b>489.2</b>	<b>431.5</b>
Nancy Roman Space Telescope	510.7	505.2	501.6	501.8	485.1	448.5	385.7
Other Missions and Data Analysis	43.5	47.2	41.7	45.8	40.7	40.7	45.8
<b>Astrophysics Explorer</b>	<b>185.3</b>	<b>204.4</b>	<b>300.4</b>	<b>300.0</b>	<b>342.9</b>	<b>404.1</b>	<b>522.9</b>
SPHEREx	66.6	68.5	89.9	96.7	75.0	24.0	6.0



# AAAC Recommendations

	AAAC Recommendation – March 2021	NASA Response
3	NSF, NASA, and DOE Office of Science should continue their efforts to mitigate the impacts of COVID-19, with a focus on early career scientists to the extent possible.	Concur. NASA response includes (i) Extended flexibilities in grant terms & conditions, (ii) Grant augmentations for early career researchers, (iii) Providing resources on work-life balance, (iv) Sponsoring mentoring program through AGU/AAS/ASGSR.
7	NASA, NSF, and DOE/Cosmic Frontier should support community efforts that increase public access to data, software, and data products across surveys.	Concur. NASA response includes Open Science Initiative which extends public data to publications, software, research products.
8	The three agencies should coordinate on guidelines and expectations for the public releases of data, access tools, and software associated with observations and simulations.	Partially concur. Agencies will coordinate on joint projects. Generally agencies policies are governed at higher levels (e.g., NASA astrophysics policies are governed by SMD).
9	The agencies and the AAAC should review priorities for access to data and simulations after the release of the 2020 Decadal Survey recommendations.	No action yet
12	NASA, NSF, and the DOE Office of Science should continue to collaborate on inter-agency initiatives that have significant community impact.	Concur. Ongoing efforts involving NASA include Fermi, NN-EXPLORE, Tri Agency Group initiative, NASA/DOE RFI, and other more informal collaborations.

# AAAC Recommendations

	AAAC Recommendation – March 2021	NASA Response
24	The AAAC recommends that the agencies continue the development of AI and ML initiatives across astrophysics including the potential creation of institutes focused on AI in the context of astrophysics.	Partially concur. NASA is developing an SMD-wide AI/ML policy and initiative. NASA does not generally support focused research institutes.
26	The AAAC recommends continuation of the expansion of dual anonymous reviews within NASA, and requests that NSF and DOE develop and adopt similar reviews or other practices that provide the committee with sufficient evidence of bias mitigation in their review processes.	Concur. NASA has expanded the use of dual anonymous peer reviews to all GO/GI (telescope allocation) reviews plus ADAP, ATP, and XRP (in astrophysics). Additional SMD reviews are dual anonymous. NASA is studying the use of dual anonymous reviews for technology, laboratory, and mission reviews.



# ATP Inclusion Criterion Pilot Program

All Astrophysics Theory Program (ATP) proposals should have included an inclusion plan. This section addresses:

- Plans for creating and sustaining a positive and inclusive working environment for those carrying out the proposed investigation, and
- Contributions the proposed investigation will make to the training and development of a diverse and inclusive scientific workforce

The inclusion plans are being evaluated for adequacy and completeness. In addition to the 20 science panels (which will evaluate all 182 proposals), there are 4 inclusion panels.

- Inclusion panels made up of astronomers active in DEI and DEI experts over a range of related fields

Feedback will be provided to the proposers as part of the panel review summaries.

- The feedback will not be folded into the adjectival ratings or selection recommendations in the current ROSES cycle, but may in future cycles
- Inclusion panels will not just be providing feedback on the plans, but will be helping us produce a lessons learned document that will record their findings on how to refine the solicitation and evaluation to best incorporate our inclusion goals as a selection criterion in future reviews
- NASA plans to invite comments from proposers regarding this pilot process after they receive their review comments



# Personnel Update



Jeff Volosin, Deputy Director of Astrophysics, is moving to Goddard Space Flight Center at the end of October to be the Director of Earth Science Projects (Code 420)



Paul Hertz, Director of Astrophysics, will delay his transition from Astrophysics Director beyond the end of the year in order to ensure continuity for astrophysics leadership and the astrophysics program



Dan Evans is now the SMD Assistant Deputy Associate Administrator for Research



Kartik Sheth is now the Assistant Director for Research Infrastructures & Science Equity at the White House Office of Science and Technology Policy (OSTP)

New staff have joined during 2021: Program Scientists Roopesh Ojha, Sanaz Vahidinia, Heather Watson; Program Executive Rachele Cocks

Additional astrophysics program scientists (both civil servants and IPAs) will be selected / hired in the near future

# Astrophysics Mission Classes

DECADAL SURVEY		EXPLORER AO		SALMON AO		ROSES	
>\$1B	\$1B	\$450M	\$225M	\$80M	\$40M	\$20M	\$0
<div>&gt;\$1B</div> <div>LARGE CLASS</div> <div>Great Observatory or Flagship</div>		<div>~450M</div> <div>SMALL CLASS</div> <div>Medium Explorer (MIDEX) PICC \$290M*</div>		<div>\$80M</div> <div>SMALL CLASS</div> <div>Standard Mission of Opportunity **</div>		<div>\$20M</div> <div>SMALL CLASS</div> <div>Pioneers SmallSat **</div>	
<div>~\$1B</div> <div>MEDIUM CLASS</div> <div>Probe</div>		<div>~225M</div> <div>SMALL CLASS</div> <div>Small Explorer (SMEX) PICC \$145M*</div>		<div>\$40M</div> <div>SMALL CLASS</div> <div>SmallSat Mission of Opportunity **</div>		<div>\$5M</div> <div>SMALL CLASS</div> <div>APRA CubeSat</div>	
						<div>\$10M</div> <div>SUBORBITAL</div> <div>APRA Balloon</div>	
						<div>\$5M</div> <div>SUBORBITAL</div> <div>APRA Sounding Rocket</div>	

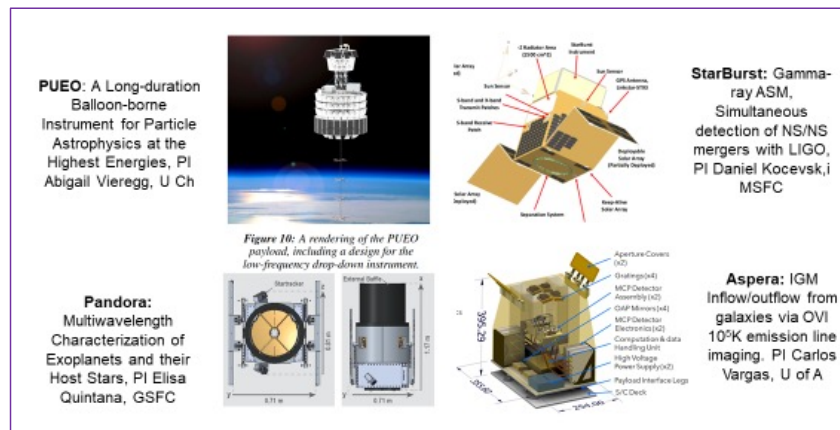
Updated January 28, 2021

\*PI Cost Cap

\*\*Includes ISS-attached  
Experiments

# Astrophysics Pioneers

- A new class of small missions offered for first time in ROSES-2020. Include SmallSats, CubeSats >6U, major balloon payloads, modest ISS attached payloads, and lunar surface CLPS payloads. \$20M maximum PI cost cap.
- Fills in the gap between existing ROSES investigations (<\$10M for APRA) and existing Explorers MO investigations (~\$35M for SmallSats).
- Solicited through ROSES; relieves burden of writing full Explorers MO proposal (ROSES 2021 Amendment D.15).



- ROSES-2021 due date NET March 2022

- First four selections in January 2020.
- Teams working on Concept Study Report; first gate decision to proceed will be in January 2022.