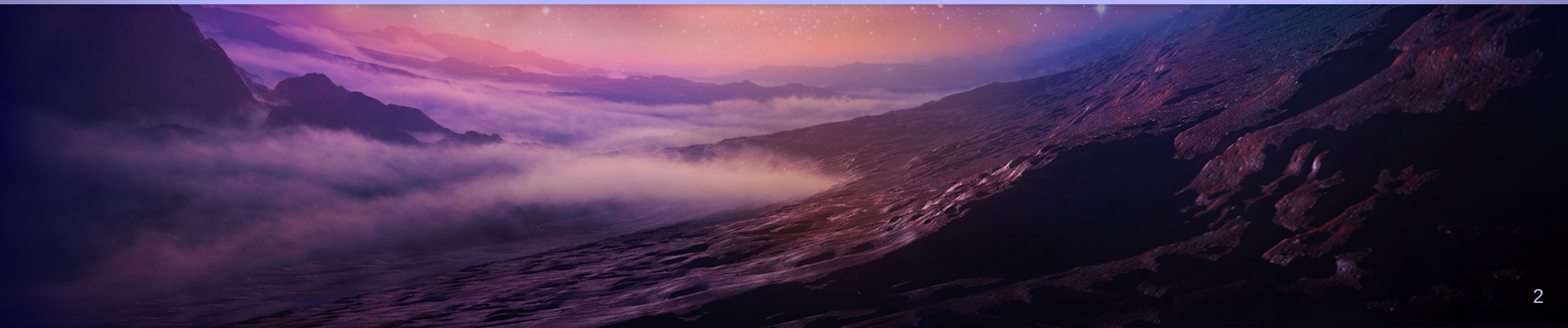
2021 Joint PAG Meeting

January 8, 2021

Paul Hertz
Director, Astrophysics Division
Science Mission Directorate

Charts to be posted on the PAG web pages

Highlights of 2020



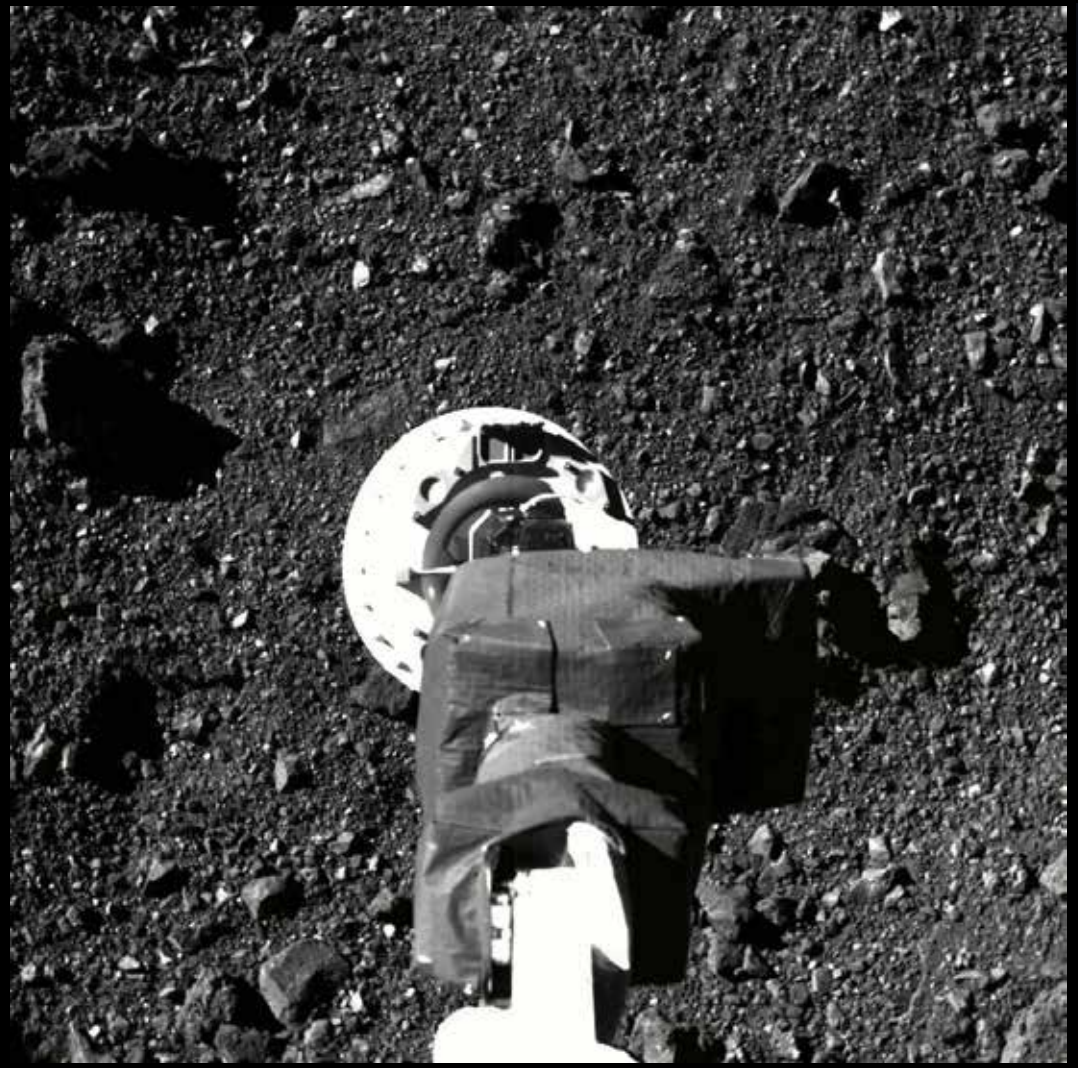
NASA SCIENCE

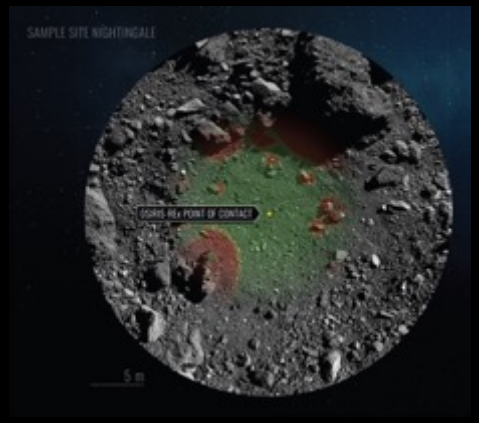
AN INTEGRATED PROGRAM

- EARTH SCIENCE
- HELIOPHYSICS
- PLANETARY SCIENCE
- ASTROPHYSICS
- BIOLOGICAL & PHYSICAL SCIENCE
- JOINT AGENCY SATELLITE

NASA's Mars 2020 Perseverance rover launched on the Atlas V-541 rocket from Launch Complex 41 at Cape Canaveral Air Force Station, Florida on July 30, 2020, at 7:50 a.m. ET. Perseverance (and the Ingenuity Mars helicopter tech demo) will land on Mars on February 18, 2021, around 3:30 pm ET.

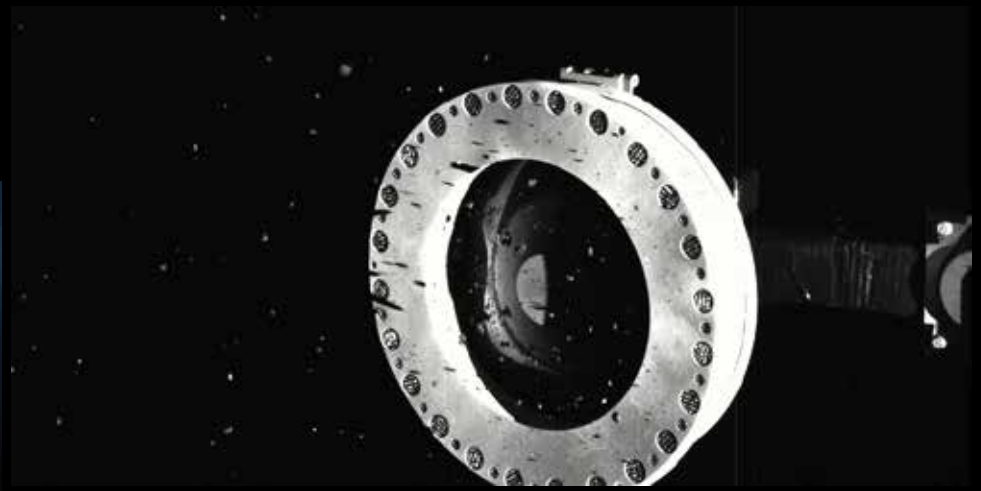
OSIRIS-REx





Touch-and-Go ('TAG') at Nightingale Crater Oct 20

Touch-and-Go Sample Acquisition Mechanism (TAGSAM) Oct 22



Sample stowed in Sample Return Capsule Oct 28

The fully assembled and folded James Webb Space Telescope on the vibration table at Northrop Grumman Space Park (September 2020). This is the configuration that Webb will be in when it is mated to the Ariane 5 launch vehicle in 2021.

Nancy Grace Roman Space Telescope

SCIENCE HIGHLIGHT

February 28, 2020 – NASA confirmed the Wide Field Infrared Survey telescope (WFIRST) for development

May 20, 2020 – NASA named its Wide Field Infrared Survey Telescope (WFIRST), in honor of Nancy Grace Roman, NASA's first chief astronomer, who paved the way for space telescopes focused on the broader universe

2020 Nobel Prize in Physics

2020 Black Holes (Penrose, Reinhard, & Ghez)

2019 Our Place in the Universe (Peebles, Mayor, & Queloz)

2017 Gravitational Waves (Weiss, Barish, & Thorne)

2011 Dark Energy (Perlmutter, Schmidt, & Riess)

Roger Penrose
“for the discovery that black hole formation is a robust prediction of the general theory of relativity”

Reinhard Genzel
"for the discovery of a supermassive compact object at the centre of our galaxy"

Andrea Ghez
"for the discovery of a supermassive compact object at the centre of our galaxy"

Building Excellent NASA Teams Requires Inclusion and Diversity

- At NASA, we recognize that excellence is only achieved with inclusive and diverse teams. We are creating a multi-pronged approach.
  - Directorate level: Hosting incubator workshops and implementing actions from those workshops focused on short-term changes to how we are operating and how we grow our leaders. Studying barriers to inclusion in mission leadership. Standing up a long-term activity focused on sustained engagement, systemic, and lasting changes.
  - Division level: Division task forces working to align division-level practices with the NASA core value and SMD science strategy. Examining the R&A process for better inclusion and diversity. Adopting a Code of Conduct to improve the inclusion and process of our panels and teams.
- Proposal Processes: Recognizing we have influence through our calls for proposals and what we reward in our selections. Piloting dual-anonymous peer review and seeking to expand that. Actively looking into how we can be a model for inclusivity.

Enhancing Participation of Minority Serving Institutions in Space Science
Monday, Jan 11 @ 6:50 pm ET

COVID-19 Impacts

Research:

NASA is focused on continuing our research programs and providing stability

- Virtual review panels for ROSES solicitations and AO mission evaluations are going well; all-virtual review panels for ROSES programs will continue until at least June 1, 2021
- NASA is thinking about continuing virtual review panels, at least in part, even after in-person meetings cease to pose a health hazard

NASA does not want the pandemic to derail careers of future leaders; we are focused on mitigating impacts

- Given current funding constraints, NASA will prioritize up to 15% of the R&A funding available for new awards toward augmentations and funded extension requests for existing awards that:
  - Are in their last year (or the last year of their first no-cost-extension);
  - Have costed their funds in a timely manner; and
  - Are for the explicit support of near-finishing graduate students / post-docs (including third-year NPPs) and non-tenured / soft-money early career researchers

COVID-19 Impacts

Missions:

NASA continues to experience disruption in the development of all missions due to COVID-related restrictions

- We assume these disruptions will continue for the foreseeable future

Many missions are expected to stay within their cost commitments (known as the ABC or Agency Baseline Commitment, which includes HQ held reserves above project budget)

- ABC is set at Confirmation Review
- In astrophysics, this includes NASA contributions to Euclid and XRISM

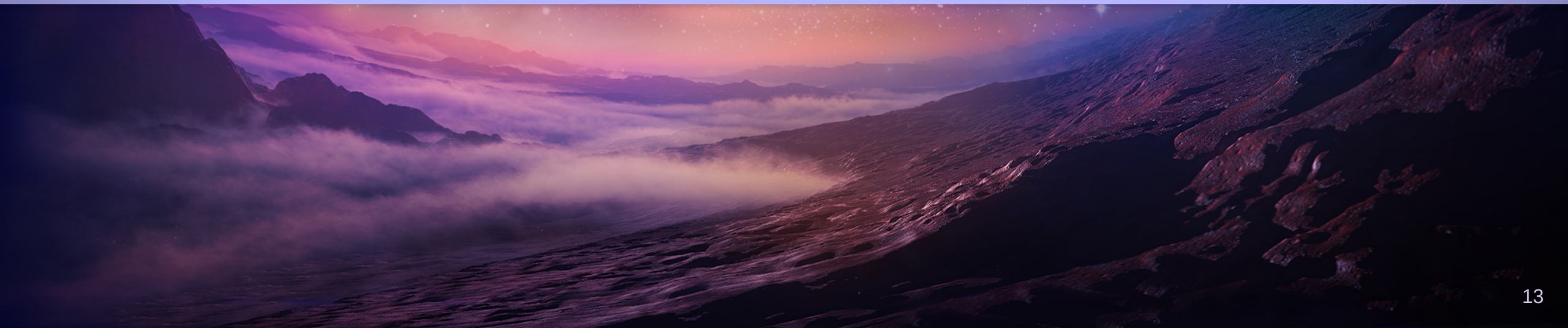
Some missions have experienced challenges that affect cost and schedule commitments

- In astrophysics, this includes Webb, Roman, and IXPE
- Missions that have been Confirmed since COVID began (e.g., SPHEREx), or will be Confirmed in the future (e.g., future Explorers) have assumed impacts from COVID included within their cost and schedule commitments

To date, challenges to Flagships (Webb, Roman) have been accommodated with no impact to Explorers or R&A

- Challenges to Explorers have been accommodated within the Explorers Program

The NASA Team



NASA Astrophysics Division

Division Director

Paul Hertz
Astrophysics Division Director

Jeff Volosin
Astrophysics Division Deputy Director

ASTROPHYSICS
NASA's Science Mission Directorate

Program Executives

E. Lucien Cox
SOFIA, GUSTO, XRISM, ExEP

Ed Griego
Astrophysics Operating Missions

Shahid Habib
COR, PCOS, ARIEL, Athena, Euclid, LISA, UltraSat

Not Pictured

Future

Janet Letchworth
Roman

Mark Sistilli
Explorers Program IXPE, SPHEREx Balloons

Cross Cutting

Eric Smith
Chief Scientist Webb

Jeanne Davis
Assoc Dir for Flight ASM Program Manager

Mario Perez
Chief Technologist SAT, RTF

Not Pictured

Lisa Wainio
Information Manager, Public Affairs Liaison

Administrative Support

Kelly Johnson
Administrative Assistant

Maria Washington
Administrative Assistant

Not Pictured

Jackie Mackall
Program Support Specialist

Ingrid Farrell
Program Support Specialist

Program Scientists

Dominic Benford
APRA Lead
Roman

Valerie Connaughton
APRA (High Energy)
XRISM, UltraSat

Dan Evans
PCOS Program
NICER
Dual Anon.PR

Michael Garcia
APRA (UV/Optical), SmallSats/Pioneers
Hubble, Athena

Thomas Hams
APRA (CR, Fund. Phys.) Rockets/Balloons
GUSTO, LISA

Hashima Hasan
Education/Comms, Citizen Science, Archives, Advisory Committees, NuSTAR, Keck

Douglas Hudgins
ExEP Program
ADAP Lead
TESS, ARIEL

Stefan Immler
Astrophysics Research Program Mgr, Chandra, XMM

Hannah Jang-Condell
FINESST, ExEP, TESS

Patricia Knezek
Astrophysics Explorers Program, SOFIA, Hubble Fellows

William Latter
APRA (Lab Astro)
Spitzer, SPHEREx, Fermi

Pamela Marcum
Exoplanet Research Program (XRP)

Roopesh Ojha
Data Management, FINESST, XMM

Aki Roberge
ASMP, Roman

Evan Scannapieco
ATP / TCAN Lead, Swift

Kartik Sheth
COR Program

Linda Sparke
On detail to the Office of the Administrator

Eric Tollestrup
APRA (IR/Submm)
Euclid, IXPE

Heather Watson
Dep. Technologist, Explorers, SmallSats/Pioneers

Not Pictured

Future

Astrophysics Program Abbreviations: ASM – Astrophysics Strategic Missions; COR – Cosmic Origins; ExEP – Exoplanet Exploration Program; PCOS - Physics of the Cosmos

NASA Town Halls

	Session	
NASA Town Hall	220	Tuesday, Jan 12 @ 1:40 pm ET
R&A Program Town Hall	Splinter	Wednesday, Jan 13 @ 12:00 pm ET
STScI Town Hall	319	Wednesday, Jan 13 @ 1:40 pm ET
Webb Space Telescope Town Hall	419	Thursday, Jan 14 @ 1:40 pm ET
Science Activation Next Phase	Splinter	Thursday, Jan 14 @ 4:10 pm ET
SOFIA Town Hall	519	Friday, Jan 15 @ 1:40 pm ET
Roman Space Telescope Town Hall	520	Friday, Jan 15 @ 1:40 pm ET

<u>Program Analysis Groups (PAGs)</u>

COPAG	Mon @ 12:00 pm	PhysPAG	Mon @ 12:00 pm
SIGs	Far-IR/Origins (Tue @ 12:00 pm)	SIGs	Multi-Messenger (Tue @ 12:00 pm)
	Low Freq Radio (Wed @ 12:00 pm)		Inflation Probe (Wed @ 12:00 pm)
	UV/Vis/Tech (Thu @ 12:00 pm)		X-ray (Wed @ 6:50 pm)
	Cosmic Origins (Fri @ 12:00 pm)		Gravitational Wave (Thu @ 12:00 pm)
			Cosmic Structure (Thu @ 4:10 pm)

Enhancing Participation of Minority Serving Institutions in Space Science (Mon @ 6:50 pm)

Join the Astrophysics Program Analysis Groups (PAGs)

The Cosmic Origins PAG (COPAG), Exoplanet Exploration PAG (ExoPAG) and Physics of the Cosmos PAG (PhysPAG) want you

Join the Executive Committee (EC), a Science Analysis Group (SAG), a Science Interest Group (SIG), or a Technology Interest Group (TIG)

WHY?

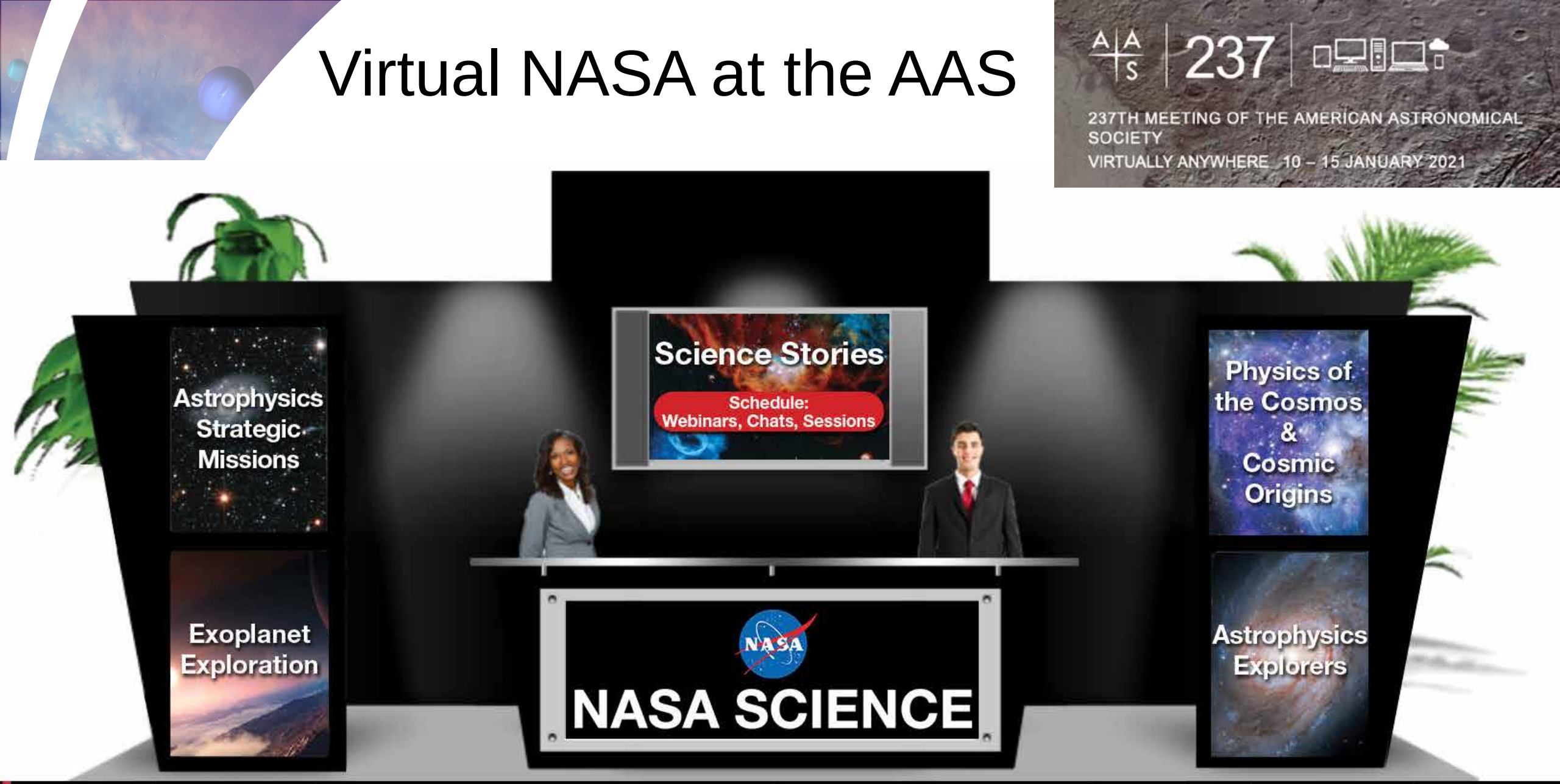
- The PAG provides NASA Astrophysics with analysis of community input and feedback on its programs; the PAG reports to NASA at meetings of the Astrophysics Advisory Committee (APAC)
- The EC coordinates the activities of the PAG and its SAGs, SIGs, and TIGs
- The SIGs and TIGs are where the community gathers to discuss common areas of interest, and the SAGs are specific efforts to analyze a specific problem; these analyses have an impact, e.g. ADAP offerings, Great Observatories report
- The PAG and its SIGs, TIGs, and SAGs will aid in analyzing and discussing the Decadal Survey; this will be important and impactful to NASA as it decides how to implement the recommendations

WHAT? HOW?

- NASA seeks ECs, SIGs, TIGs, and SAGs that are inclusive and diverse across a variety of axes to be representative of the broad astrophysics community
- Each PAG has a letter to the community inviting applications
- Please speak to the Program Scientists or Chief Scientists to learn more

https://cor.gsfc.nasa.gov/copag/ https://exoplanets.nasa.gov/exep/exopag/ https://pcos.gsfc.nasa.gov/physpag/

Virtual NASA at the AAS



NASA Science Webinars

Date	Time (ET)	Presenter(s)	Presentation Title
Monday, January 11	12:00 - 12:30 pm	Aki Roberge, NASA	Exoplanet Science with the Nancy Grace Roman Space Telescope
Monday, January 11	12:00 - 12:30 pm	Jonathan Gardner, NASA	The James Webb Space Telescope Science
Tuesday, January 12	2:30 - 3:00 pm	James De Buiser, USRA	SOFIA: Science from the Stratosphere
Tuesday, January 12	4:00 - 4:30 pm	Dan Evans, NASA	Dual-Anonymous Peer Review at NASA
Wednesday, January 13	12:30 - 1:00 pm	Ryan Hickox, Dartmouth	First Black Holes
Wednesday, January 13	1:30 - 2:00 pm	Travis Fischer, STScI	The ULLYSES Program: Charting Young Stars' Ultraviolet Light with Hubble
Wednesday, January 13	5:00 - 5:30 pm	Dominic Benford, NASA	Wide Field Survey Science with the Nancy Grace Roman Space Telescope
Thursday, January 14	12:00 - 12:30 pm	John Mather, NASA	Overview of the James Webb Space Telescope
Thursday, January 14	2:00 - 2:30 pm	Grant Tremblay, Harvard	The Once & Future Great Observatories
Thursday, January 14	4:00 - 4:30 pm	Marc Kuchner, NASA	Citizen Science

Ask the Director: Paul Hertz will be available for Q&A, Thursday, January 14 @ 2:40 pm ET

Informal Chat with NASA Staff, Every Day, Monday - Friday @ 2:40 pm ET

Zoom Room Chats @ 2:40 – 3:10 pm ET

Date	Presenter(s)	Chat Topic
Mon, Jan 11	Eliad Peretz, NASA	Orbiting Configurable Artificial Star - ORCAS
Mon, Jan 11	Lynn Cominsky, Sonoma State U	NASA's Neurodiversity Network
Mon, Jan 11	Naseem Rangwala, NASA	How to do Astronomy from 40,000 Feet
Mon, Jan 11	NASA Staff	Informal Chat with NASA Staff
Tue, Jan 12	Steven Crawford, NASA	Open Science at NASA
Tue, Jan 12	Steve Finkelstein, U Texas	JWST Early Release Science: CEERS
Tue, Jan 12	Kristen Erickson, NASA	NASA Science Activation: NASA's Approach to Connect Science to Learners and Communities
Tue, Jan 12	Taifa Simpson, USRA	NASA Postdoctoral Program Information Session
Tue, Jan 12	NASA Staff	Informal Chat with NASA Staff
Wed, Jan 13	Erin Smith, NASA	The James Webb Space Telescope Current Status
Wed, Jan 13	Jack Burns, UC Boulder	Transformative Radio Astrophysics from the Moon
Wed, Jan 13	Evan Scannapieco, NASA	Astrophysics R&A Diversity – Equity - Inclusion Task Force
Wed, Jan 13	NASA Staff	Informal Chat with NASA Staff
Thu, Jan 14	Paul Hertz, NASA	Q&A/Chat with NASA's Director of Astrophysics, Paul Hertz
Thu, Jan 14	Kristen Erickson, NASA	NASA Science Activation: NASA's Approach to Connect Science to Learners and Communities
Thu, Jan 14	Taifa Simpson, USRA	NASA Postdoctoral Program Information Session
Thu, Jan 14	NASA Staff	Informal Chat with NASA Staff
Fri, Jan 15	Stefan Immler, NASA	NASA Astrophysics Research and Analysis, Q&A with Stefan Immler
Fri, Jan 15	NASA Staff	Informal Chat with NASA Staff

Keep Informed about NASA

NSPIRES mailing list – information about NASA solicitations

https://nspires.nasaprs.com/

Cosmic Origins mailing list, Exoplanet Exploration mailing list, Physics of the Cosmos mailing list – information about NASA missions and science

https://cor.gsfc.nasa.gov/cornews-mailing-list.php

https://exoplanets.nasa.gov/exep/exopag/announcementList/

https://pcos.gsfc.nasa.gov/pcosnews-mailing-list.php

NASA Astrophysics Federal Advisory Committees

Astrophysics Advisory Committee (APAC)
https://science.nasa.gov/researchers/nac/science-advisory-committees/apac

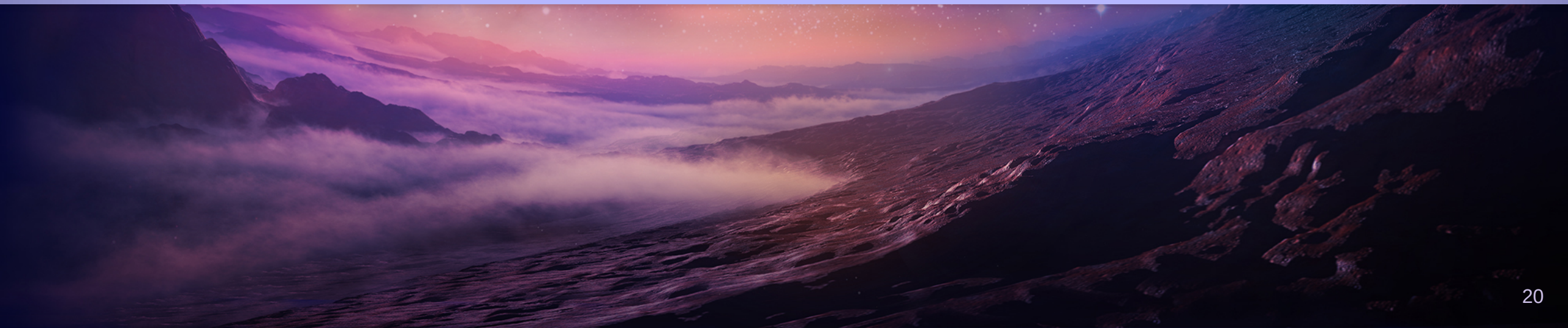
NASEM Committee on Astronomy and Astrophysics (CAA)
http://sites.nationalacademies.org/bpa/bpa_048755

Astronomy and Astrophysics Advisory Committee (AAAC)
https://www.nsf.gov/mps/ast/aaac.jsp

Sign up to be a panel reviewer:

https://science.nasa.gov/researchers/volunteer-review-panels

Research Program Update



2021 Astrophysics Research Program Elements

ROSES-21:

Supporting Research and Technology

- Astrophysics Theory Program (ATP), every other year
- Astrophysics Research & Analysis (APRA)
- Strategic Astrophys Tech (SAT) (dependent on Astro2020)
- Roman Technology Fellowships (RTF)

Data Analysis

- Astrophysics Data Analysis (ADAP)
- GO/GI programs for Fermi, Swift, NuSTAR, TESS, NICER

Mission Science and Instrumentation

- Astrophysics Pioneers (suborbital science investigations)
- Suborbital payloads solicited through APRA
- XRISM Guest Scientist New
- Roman Research and Support Opportunities New

Cross Divisional

- Exoplanets Research Program (XRP)
- Topical Workshops, Symposia and Conferences (TWSC)
- Citizen Science Seed Funding Program New
- Graduate Student Research Awards (FINESST)

Not in ROSES-21:

Separately Solicited

- GO/GI/Archive/Theory programs for Hubble, Chandra, SOFIA, Webb
- NASA Hubble Fellowship Program (NHFP)
- NASA Postdoctoral Program (NPP)
- Support for XMM-Newton U.S. PIs selected by ESA

Not Solicited this Year

- Theoretical and Computational Astrophysics Networks (TCAN), every three years
- Astrophysics Explorers U.S. PIs (APEX USPI), every two to three years

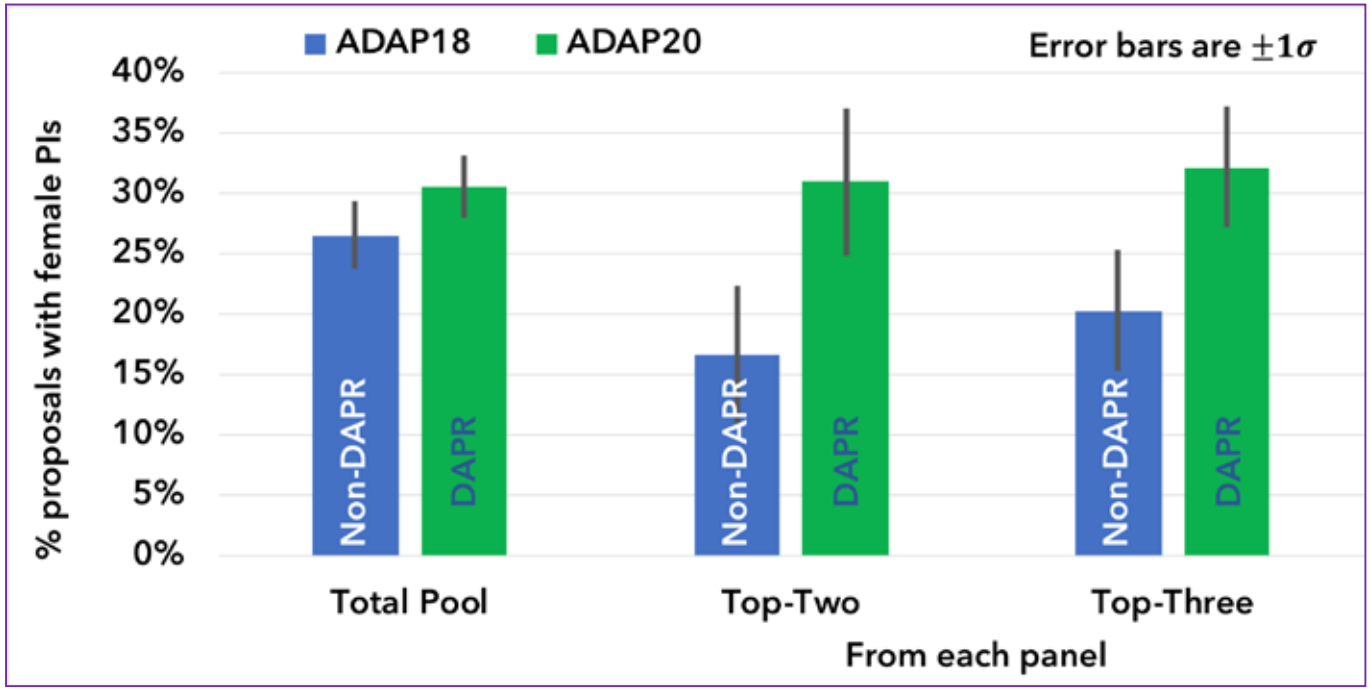
Red – evaluated using dual-anonymous peer reviews

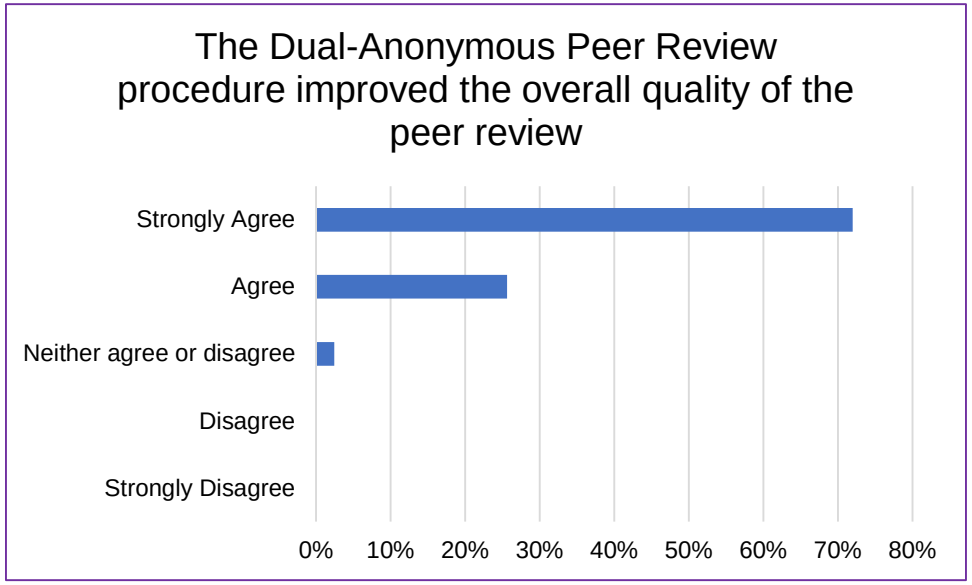
NASA Research Program Town Hall
Splinter Session
Wednesday, Jan 13 @ 12:00 pm ET

NASA R&A Zoom Chat
NASA Virtual Booth
Friday, Jan 15 @ 2:40 pm ET

Dual-Anonymous Peer Review

- Dual-Anonymous Peer Review (DAPR) has successfully been used in multiple Astrophysics programs
- All Astrophysics GO/GI programs have permanently converted
- Astrophysics Data Analysis and Habitable Worlds among SMD ROSES programs converted in 2020
- Will be joined by Exoplanet Research and Astrophysics Theory programs in ROSES-2021





NASA Science Webinar : Dual Anonymous Peer Review at NASA
Daniel Evans, Tuesday, Jan 12 @ 4:00 pm ET

R&A Grant Extensions & Flexibilities

(COVID-19 mitigation)

NASA does not want the pandemic to derail careers of future leaders; we are focused on mitigating impacts

Within current funding constraints, NASA will prioritize augmentations and funded extension requests for existing awards that:

- Are in their last year (or the last year of their first no-cost-extension);
- Have costed their funds in a timely manner; and
- Are for the explicit support of near-finishing graduate students / post-docs (including third-year NPPs) and non-tenured / soft-money early career researchers

NASA has issued a ROSES call for funded extensions (ROSES-20, Appendix E.10)

- Existing awardees may submit Post COVID-19 Recovery proposals at any time until the final due date of March 5, 2021. Requests received by January 4, 2021, will be processed as a group. Requests submitted after January 4, 2021 but before March 5, 2021, will form a second group and will be processed together.
- This initiative must be funded from the current R&A Program, size of commitment is approximately 15% of funding available for new awards in FY21
- There will be 15% fewer new awards in FY21

Government-wide flexibility for paying salaries of researchers, even if they could not work because of COVID, expired on September 30. NASA has established a process to consider extending this flexibility to pay salaries on a case-by-case basis

https://science.nasa.gov/researchers/covid-and-awards

Why Volunteer to Serve on a NASA Peer Review Panel?

Personal professional development:

- See how the whole review process works
- Learn what constitutes excellent proposals
- Network with your professional colleagues and NASA scientific staff

Institutional achievement:

- Improve at competing for NASA money
- Increase knowledge of NASA's research and technology programs

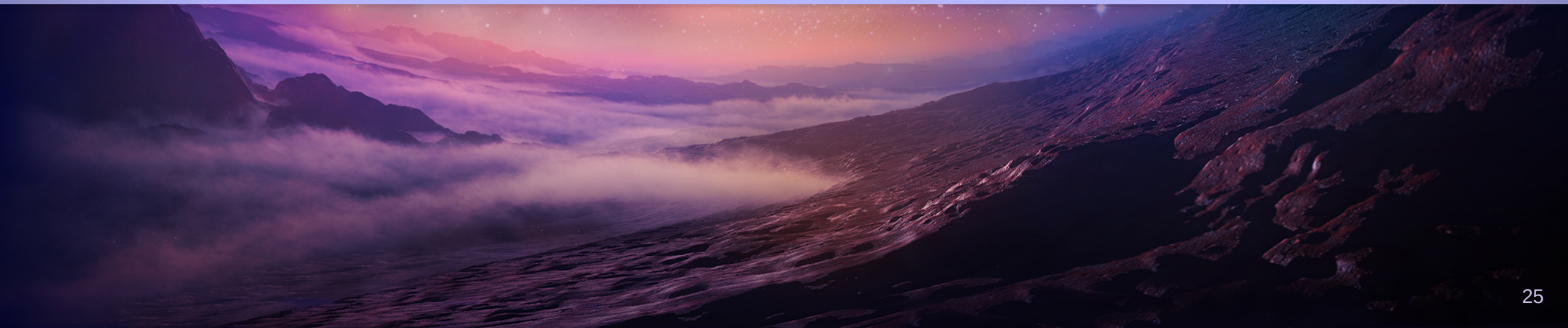
Investment in the future:

- Help select the most transformative science
- Ensure that all proposals receive a fair and competent review

Sign up to be a panel reviewer:

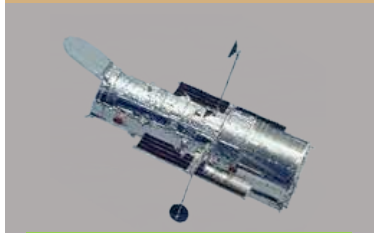
https://science.nasa.gov/researchers/volunteer-review-panels

Mission Program Update



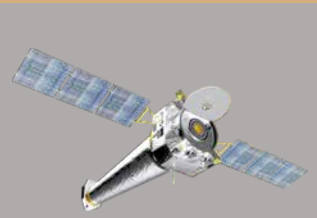
Astrophysics Missions in Operations

Hubble 4/90
NASA Strategic Mission



Operations Nominal

Chandra 7/99
NASA Strategic Mission



Operations Nominal

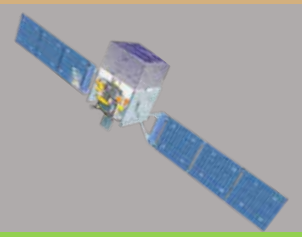
XMM-Newton 12/99
ESA-led Mission

Operations Nominal (ESA)

Gehrels Swift 11/04
NASA MIDEX Mission

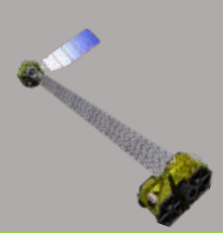
Operations Nominal

Fermi 6/08
NASA Strategic Mission



Operations Nominal

NuSTAR 6/12
NASA SMEX Mission



Operations Nominal

SOFIA 5/14
NASA Strategic Mission

Ops Restarted Aug 17 - Sep 29 Planned Maint. Oct '20 - Jan '21

ISS-NICER 6/17
NASA Explorers Miss. of Oppty

Operations Nominal

TESS 4/18
NASA MIDEX Mission

Operations Nominal

Balloon Program
Four Campaigns per Year

2020 Operations Suspended 2021 TBD

Sounding Rockets
Worldwide Campaigns

Operations Resumed Sep 8

Data Archives
HEASARC, IPAC, MAST, etc.

Operations Nominal

STScI Town Hall (Session 319)
Wednesday, Jan 13 @ 1:40 pm ET

SOFIA Town Hall (Session 519)
Friday, Jan 15 @ 1:40 pm ET

Astrophysics Mission Classes

Mission Class	How initiated	Total Cost (PI cost cap when different)
Large: Great Observatory or Flagship	Decadal Survey	> $1B
Medium: Probe	Decadal Survey	~$1B
Small: Medium Explorer (MIDEX)	Explorer AO	~$450M ($290M)
Small Explorer (SMEX)	Explorer AO	~$225M ($145M)
Standard Mission of Opportunity *	SALMON AO	$80M
SmallSat Mission of Opportunity *	SALMON AO	$40M
Pioneers SmallSat *	ROSES	$20M
APRA CubeSat	ROSES	<$5M **
Suborbital: Pioneers Balloon	ROSES	$20M
APRA Balloon	ROSES	<$10M **
APRA Sounding Rocket	ROSES	<$5M **

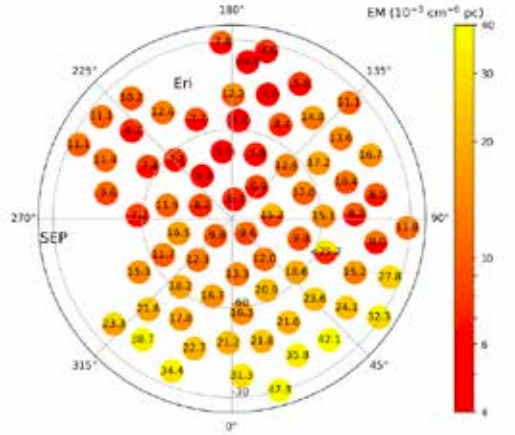
* includes ISS-attached experiments

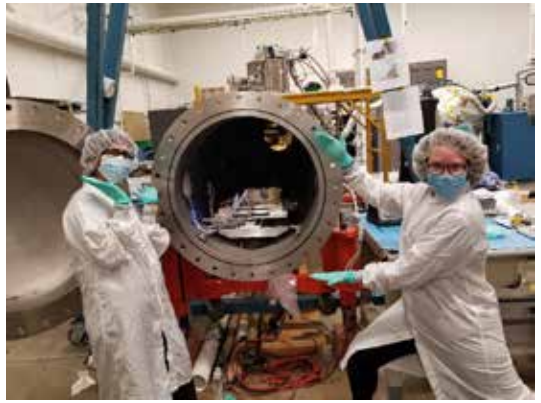
** not explicitly cost capped; value is historical upper bound for support within APRA

Astrophysics CubeSats

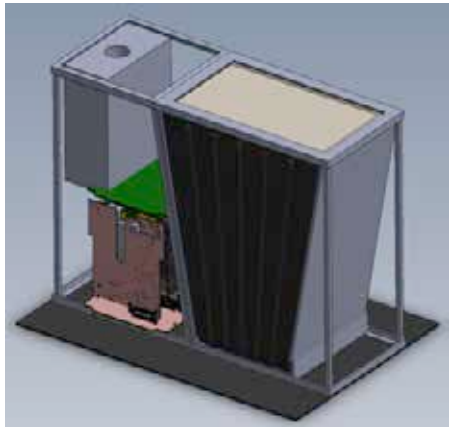
Solicited annually in ROSES/APRA, ~1 new start per year, ~<$5M each total cost

HaloSat: PI Phil Karret (U of Iowa), Launch May 2018,Reentered Jan 2021, OIV line in Galaxy halo, determine mass and structure of Galaxy halo



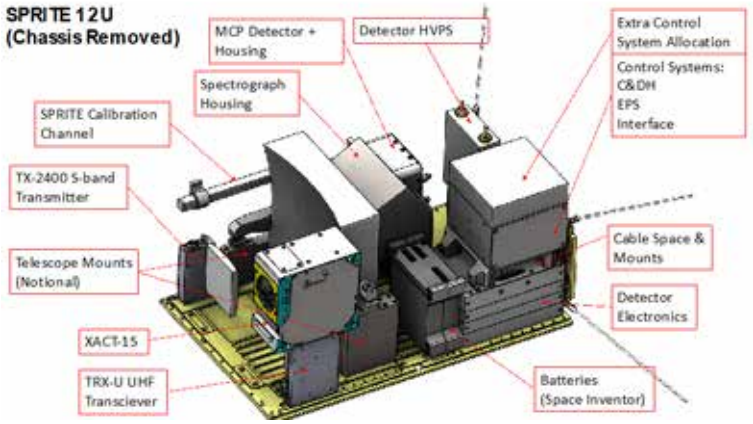


CUTE: PI Kevin France (CU), Launch Sep 2021, UV Imaging of hot Jupiter ablation, (Arika Egan & Ambily Suresh in lab)



BlackCat: PI Abe Falcone (Penn St U), Launch NET Mar 2024, 2-20 KeV wide FOV localization of X-ray transients, real-time 'cell phone' downlink

BurstCube: PI Jeremy Perkins (NASA GSFC), Launch NET Dec 2021, GRB monitor w/ TDRSS real-time event notification



SPRITE, PI Brian Fleming (CU), Launch NET Jan 2023, UV spectra of ionizing radiation from star forming galaxies

Astrophysics Pioneers

New in 2020

Major extended duration balloon payloads, CubeSats larger than 6U, and modest ISS attached payloads are more expensive than ROSES/APRA can accommodate (<$10M maximum)

Pioneers: A new class of small missions offered for first time in ROSES-2020, $20M maximum PI cost cap

- Include SmallSats, CubeSats >6U, major balloon payloads, and modest ISS attached payloads with a $20M cost cap, not including launch
- Fill in the gap between existing ROSES investigations (<$10M for APRA) and existing Explorers MO investigations (~$35M for SmallSats)
- Solicit through ROSES; relieves burden of writing full Explorers MO proposal
- Manage as Research and Analysis projects with enhanced research project processes with defined gates and light touch management from WFF and HQ, rather than flight project processes appropriate for a Small Explorer (SMEX) mission

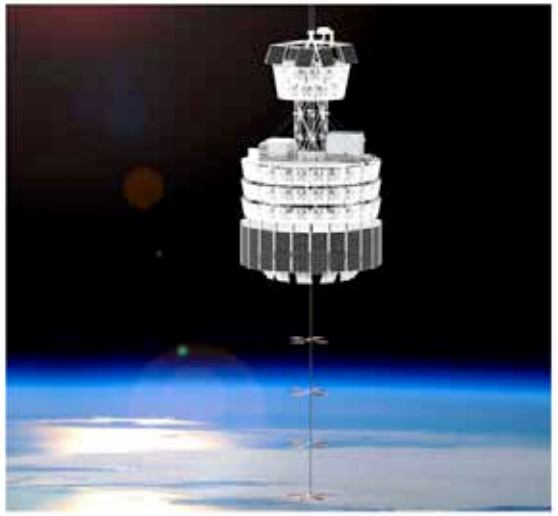
Received 24 proposals on October 8, 2020 (17 SmallSats, 7 Balloons); most were selectable

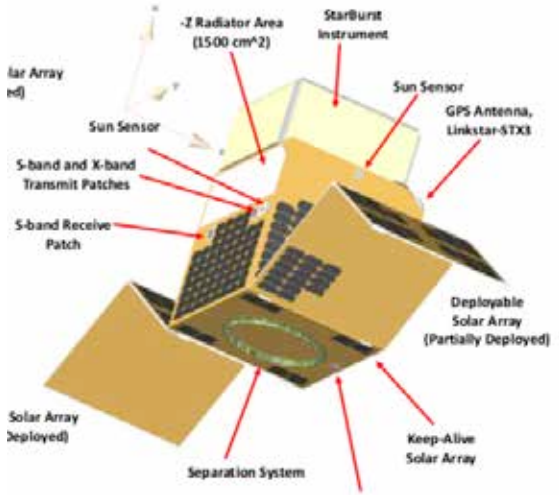
Selection of 4 proposals announced January 2021 (3 SmallSats, 1 Balloon)

Next round of Pioneers proposals due in Fall 2021

Astrophysics Pioneers-2020 Selections

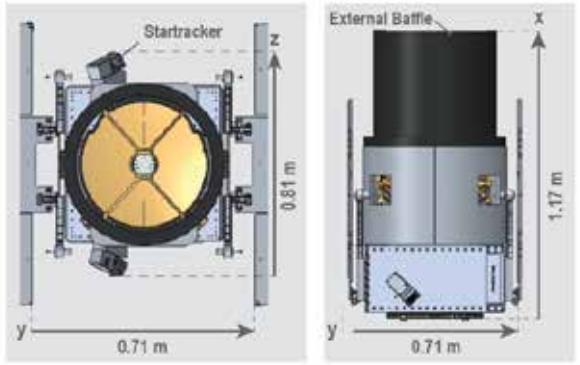
PUEO: A Long-duration Balloon-borne Instrument for Particle Astrophysics at the Highest Energies (PI Abigail Vieregg, U. Chicago)

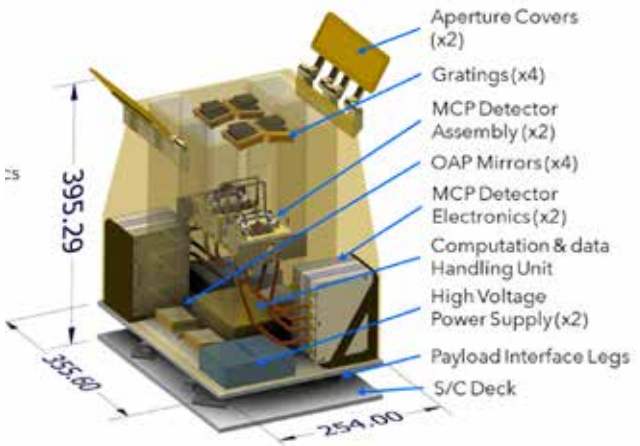




StarBurst: Gamma-ray ASM, Simultaneous detection of NS/NS mergers with LIGO (PI Daniel Kocevski, NASA MSFC)

Pandora: Multiwavelength Characterization of Exoplanets and their Host Stars (PI Elisa Quintana, NASA GSFC)



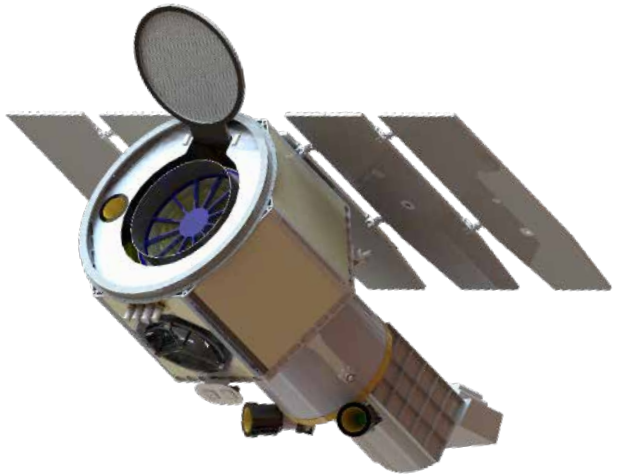


Aspera: IGM Inflow/outflow from galaxies via OVI 10^5K emission line imaging (PI Carlos Vargas, U. Arizona)

Astrophysics Explorers in Competitive Phase A

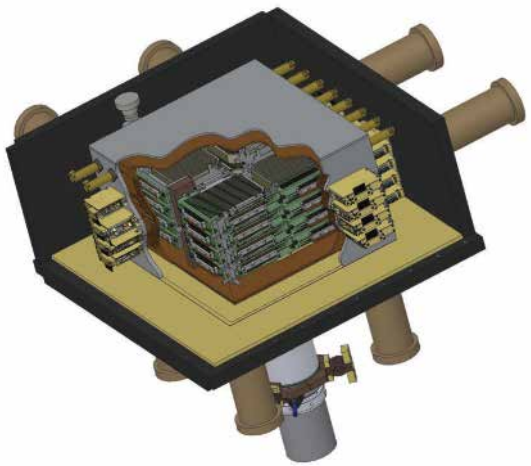
Small Explorers

ESCAPE
PI: K. France, U Colorado



Do extreme ultraviolet stellar flares zap atmospheres of exoplanets in the habitable zone?

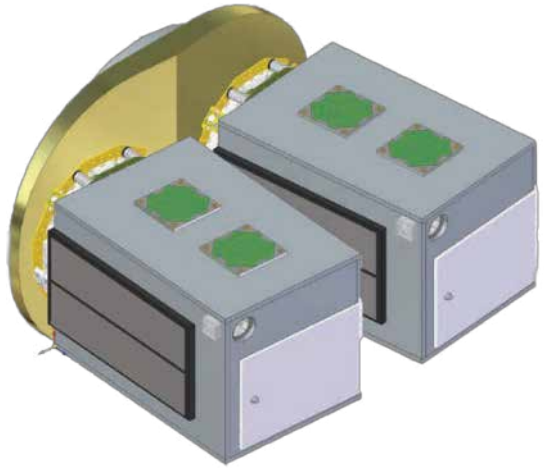
COSI
PI: J. Tomsick/UC Berkeley



MeV gamma-rays trace Milky Way's supernova activity, positron production; polarization in gamma-ray bursts

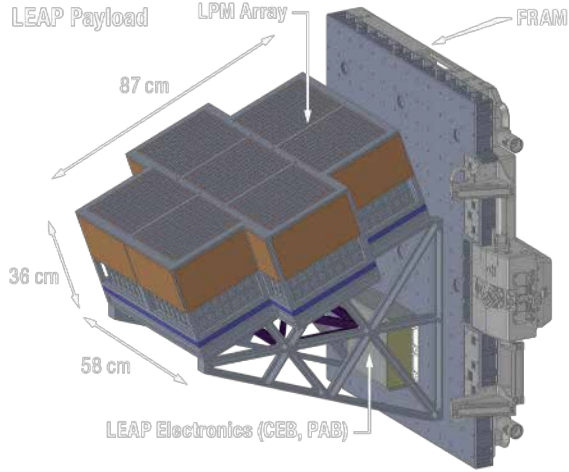
Missions of Opportunity

Dorado
PI: B Cenko/GSFC



Two 12U CubeSats watch for UV light when neutron stars merge

LEAP (on ISS)
PI: M. McConnell/ U New Hampshire



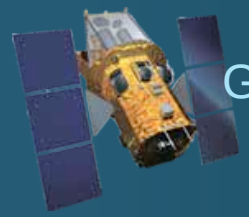
Polarization of gamma-ray bursts sheds light on jet structure

Concept Study Reports due March 4, 2021

SMEX/MO downselect fall 2021

Astrophysics Explorers Program

MIDEX 2021
Comm Ann release Sep 29, 2020
Draft AO release Jan 6, 2021
Comments due Feb 25, 2021
Final AO release August 2021
NOIs due October 2021
Proposals due December 2021
ALL FUTURE DATES TARGETS

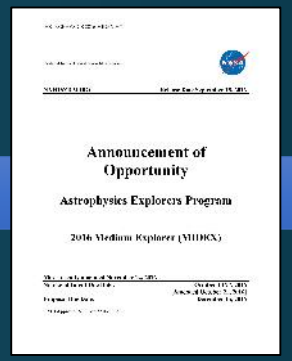

Gehrels
Swift


NuSTAR

4 AOs per decade

MIDEX
2011

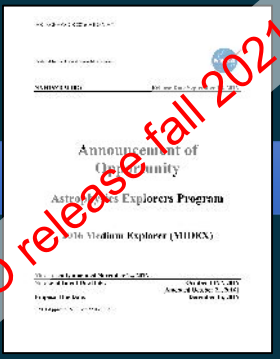
SMEX
2014



MIDEX
2016

SMEX
2019

Downselect fall 2021



MIDEX
2021

AO release fall 2021

Small and
Mid-Size
Missions


TESS


IXPE

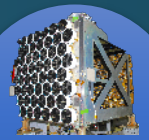

SPHEREx

ESCAPE
COSI

Directed
2013


Euclid

Missions of
Opportunity


NICER


GUSTO


ARIEL

Dorado
LEAP

Directed
2017


XRISM

Astrophysics and Artemis

Every opportunity for lunar science is open to astrophysics – if you have a great idea, propose it

Artemis enables astrophysics

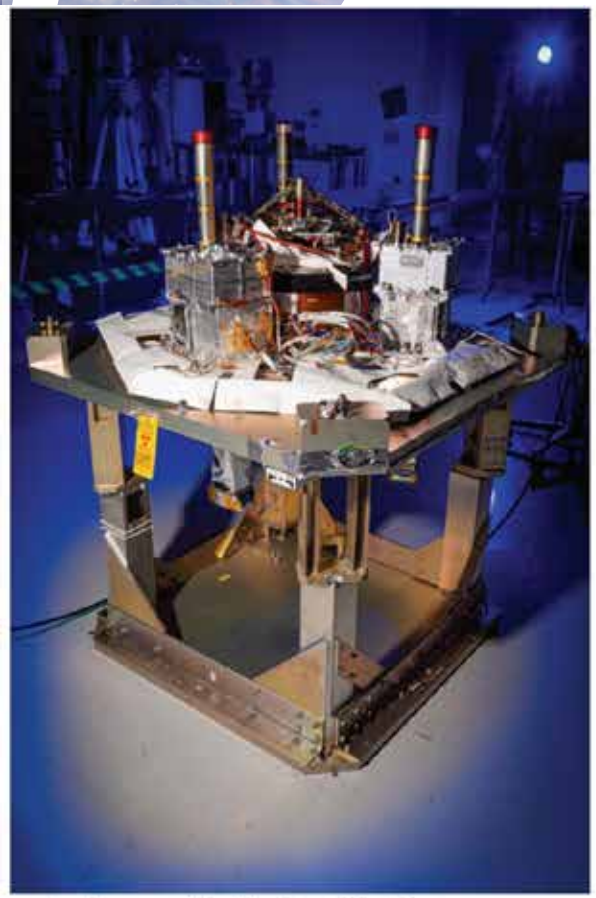
- All science opportunities enabled by Project Artemis include astrophysics
- Most important criterion for proposals remains the astrophysics science merit

There are many opportunities to propose astrophysics that uses Artemis capabilities

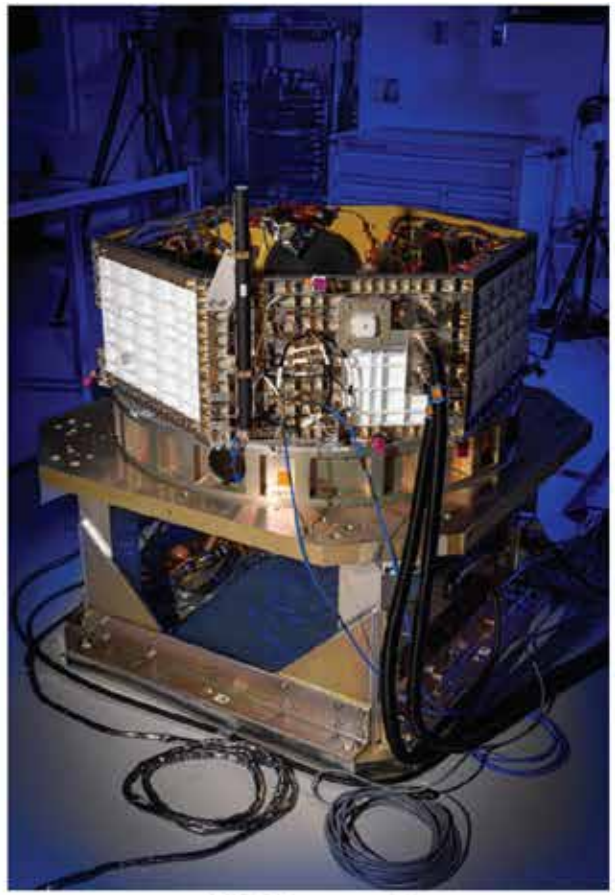
- Lunar surface astrophysics experiments can be proposed to the PRISM program of small landed payloads (in ROSES)
  - PRISM Step 2 proposals are due February 3, 2021
  - Two lunar surface astrophysics experiments have been selected and manifested for 2021:
    Low-frequency Radio Observations from the Near Side Lunar Surface Instrument (PI: R. MacDowall, GSFC)
    Next Generation Lunar Retroreflectors (PI: D. Currie, University of Maryland)
- Astrophysics Explorers Mission of Opportunity calls (including 2021 Explorers MO) allow proposals for cislunar smallsat missions
- APRA and Pioneers calls (in ROSES) allow proposals for cislunar cubesats and smallsats

Astro2020 Decadal Survey will identify any compelling astrophysics that is both a high priority and enabled by the capabilities being developed within the Artemis program

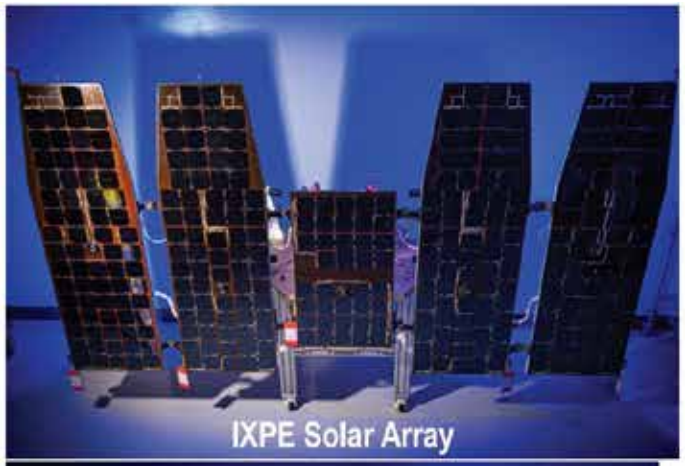
Imaging X-ray Polarimeter Explorer



Instrument & Deployable Boom
Integrated to Top Deck



IXPE Spacecraft



Mirror Module Assembly (MMAs)
Integrated on MMSS Deck

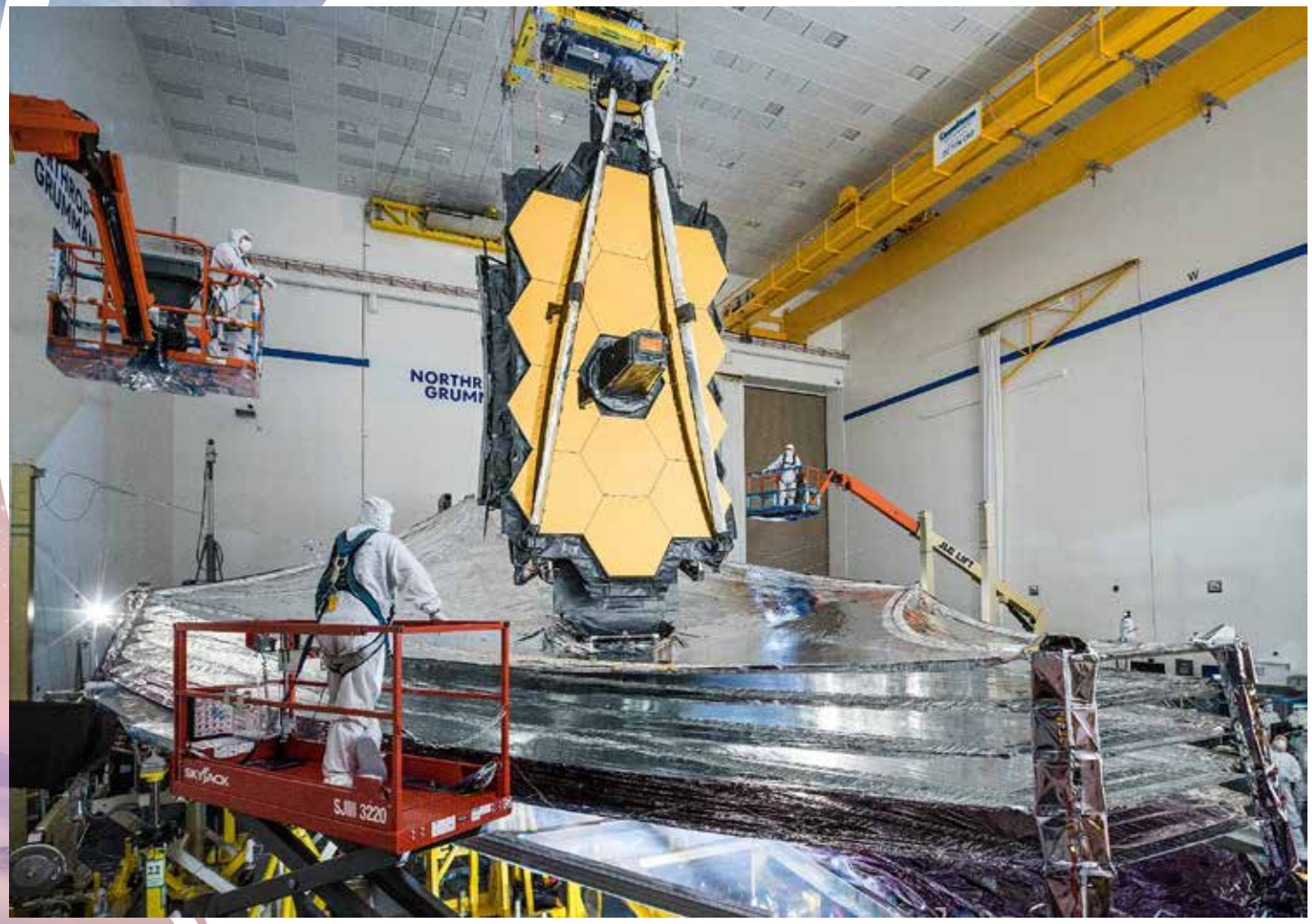
Flight Hardware Assembly is Near Complete

Image credits: Ball Aerospace

- KDP-D successfully passed on November 2, 2020
- All observatory elements have been delivered to Ball Aerospace, Boulder CO
- Observatory integration began December 7, 2020
- Revised launch date is November 2021

https://ixpe.msfc.nasa.gov/

James Webb Space Telescope



The final deployment of Webb's sunshield on Earth (December 2020). Webb will undergo folding and stowing before shipment and mating to the Ariane 5 in 2021.

2020 Accomplishments

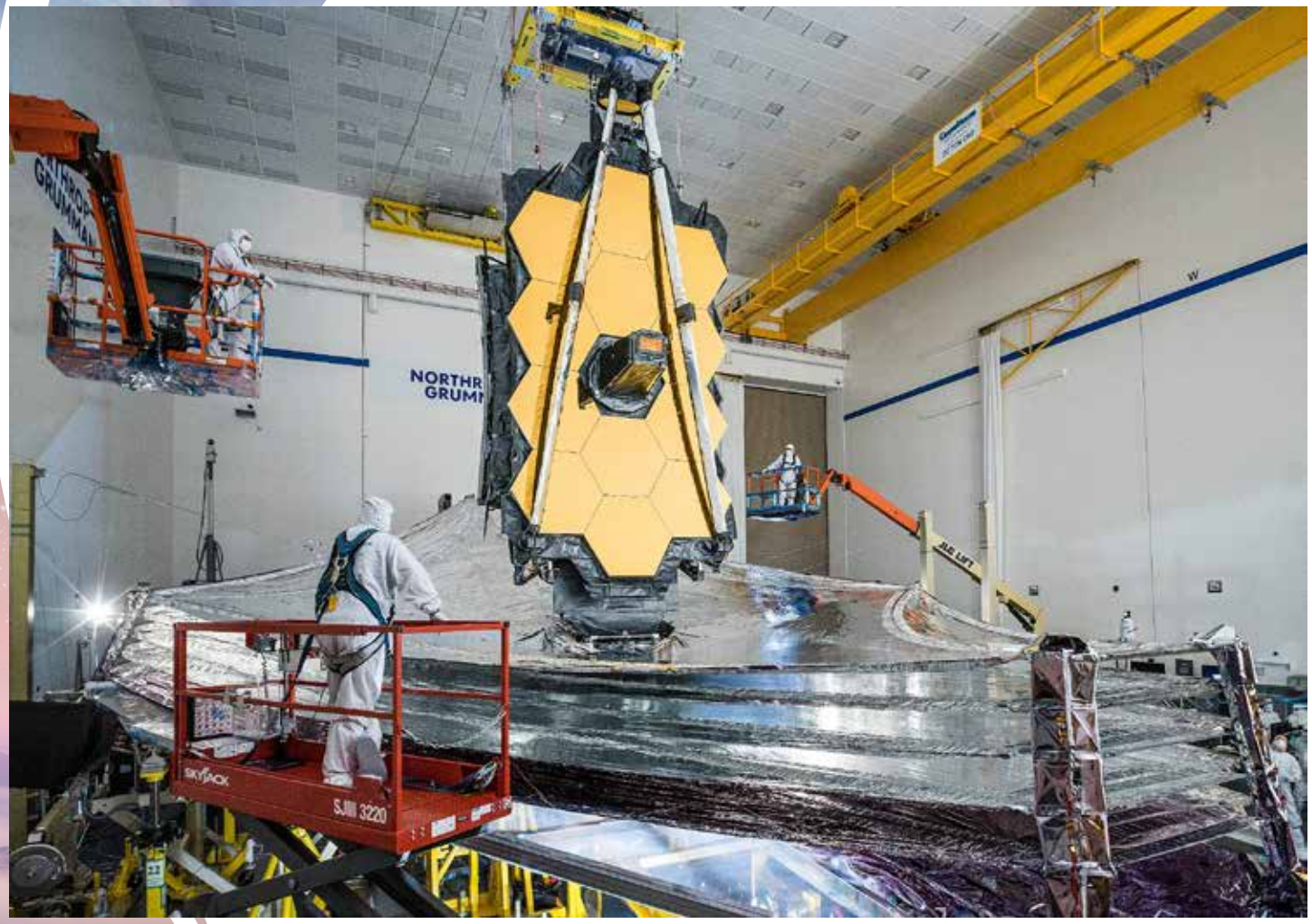
- Work continues at Northrop Grumman, but at lower efficiency due to social distancing practices required by COVID19 response
- Changed launch date from March 2021 to October 2021
- Conducted several mission rehearsals at the STScI mission operation center
- Completed Observatory-level environmental tests
- Completed Observatory-level post environmental test deployments
- Received ~1200 proposals in the Cycle 1 GO call

2021 Plans

- Final stow after post environmental deployments
- Ready Observatory for shipping to launch site
- Additional mission rehearsals at STScI
- Launch Webb in October 2021

Webb Town Hall (Session 419)
Thursday, Jan 14 @ 1:40 pm ET

James Webb Space Telescope



The final deployment of Webb's sunshield on Earth (December 2020). Webb will undergo folding and stowing before shipment and mating to the Ariane 5 in 2021.

NASA Science Webinar: Webb
Monday, Jan 11 @ 12:00 pm ET

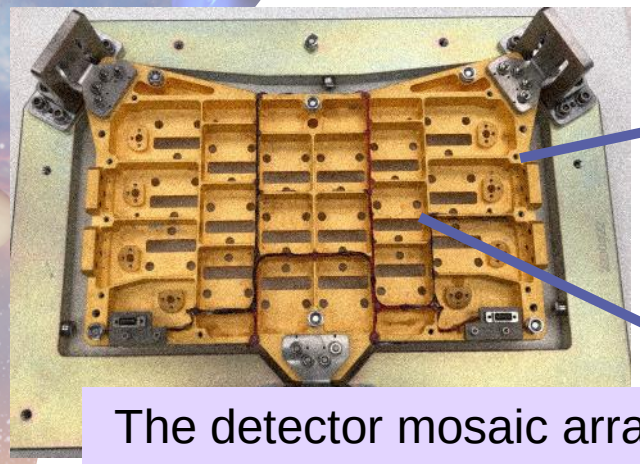
Webb Zoom Chat @ NASA Booth
Wednesday, Jan 13 @ 2:40 pm ET

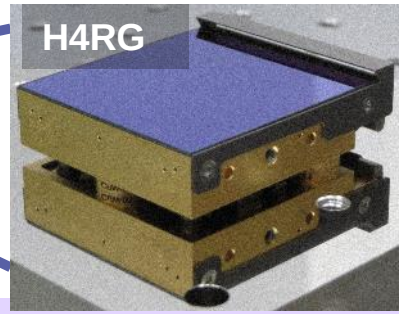
NASA Science Webinar: Webb
Thursday, Jan 14 @ 12:00 pm ET

Webb Town Hall (Session 419)
Thursday, Jan 14 @ 1:40 pm ET

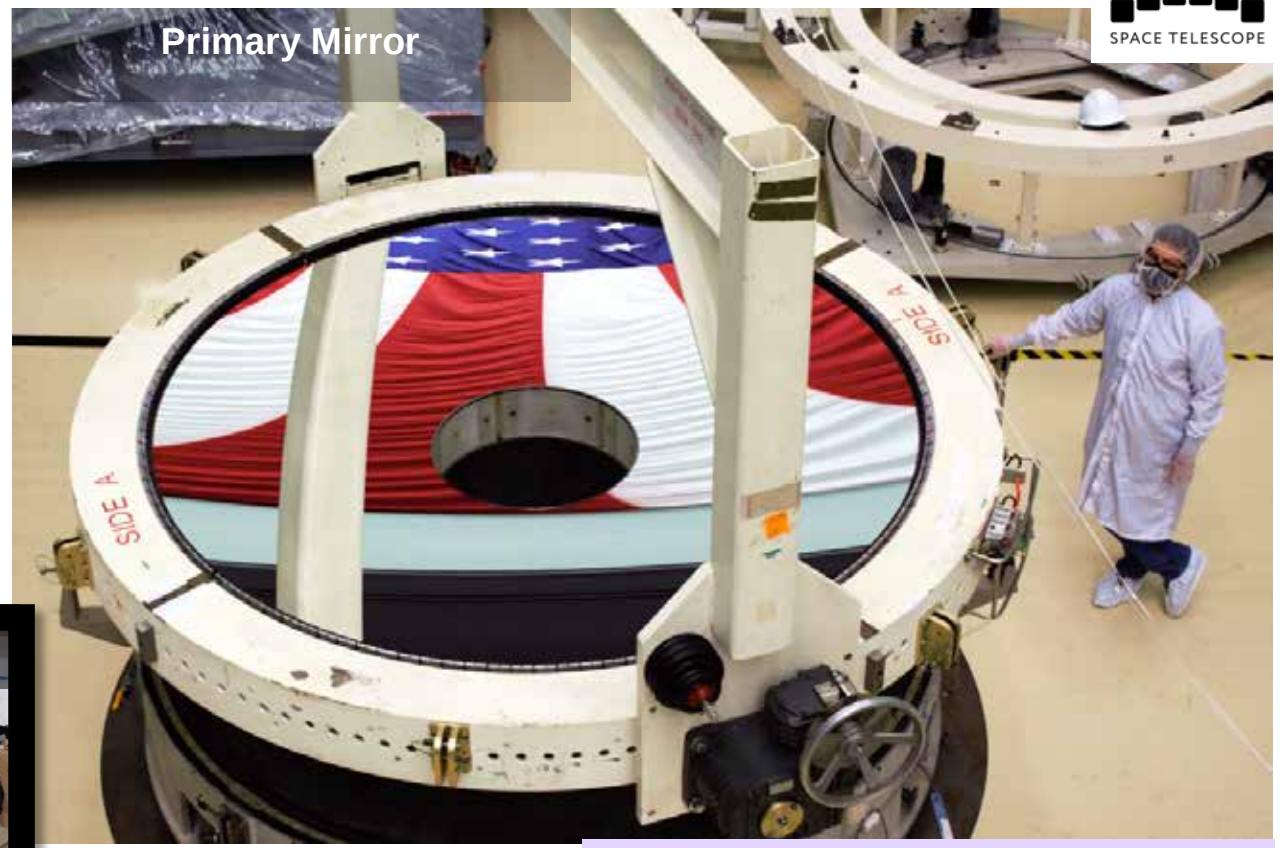
https://webb.nasa.gov/

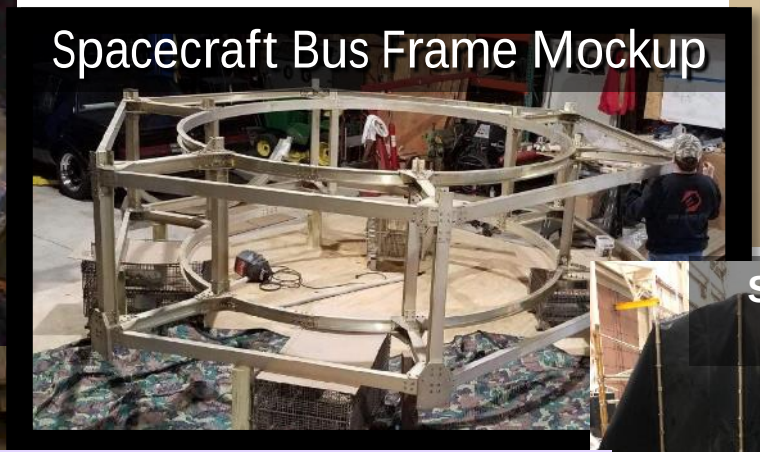
Roman Hardware Progress

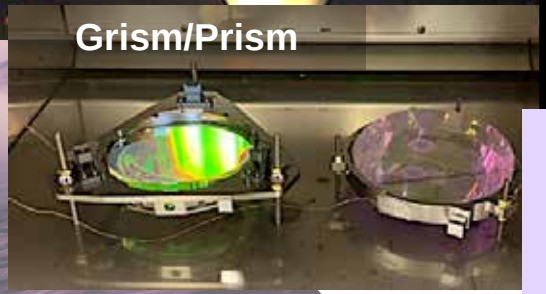




The detector mosaic array will hold 18 H4RG Sensor Chip Assemblies (SCAs).
15 of 18 required SCA detectors are in hand.







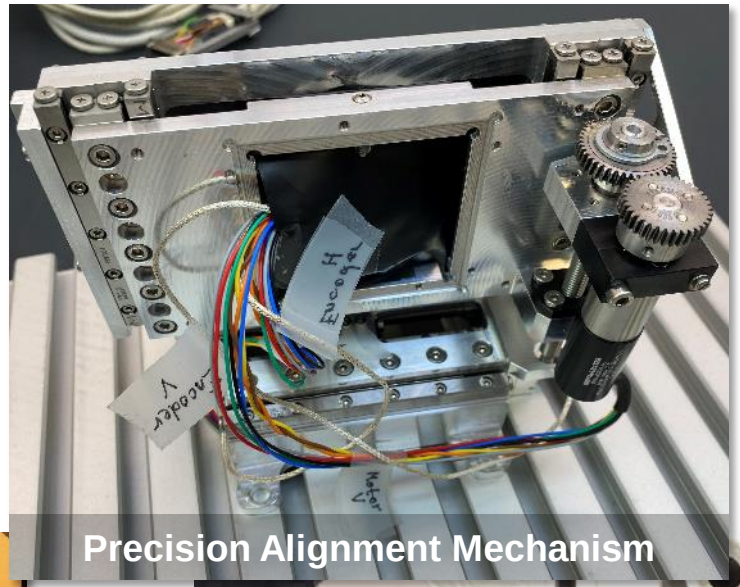
Engineering Test/Development Units and Mock-ups aid in maturing designs and assembly processes.

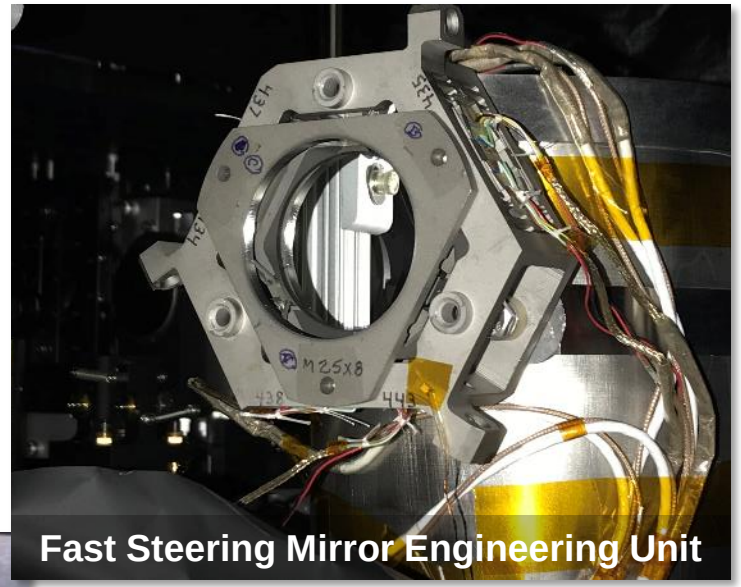
Primary and secondary mirror fabrication complete. Telescope finished by end of 2021.

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

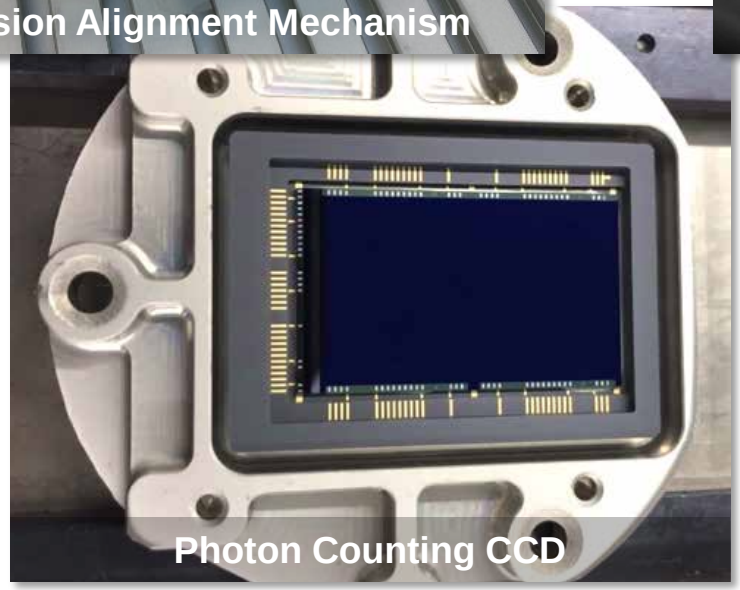
Coronagraph Instrument Technology Demonstration Hardware Progress


Deformable Mirror TRL-6 Model


Precision Alignment Mechanism


Fast Steering Mirror Engineering Unit


Shaped Pupil Mask Set


Photon Counting CCD

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

Roman Space Telescope

Roman Science Interest Group (RSIG) formed to provide broad-based community input to the Roman project and NASA Headquarters

- RSIG documents available at https://roman.gsfc.nasa.gov/science/rsig.html

Critical design reviews for telescope, wide field instrument, coronagraph, instrument carrier, spacecraft, and ground system to be completed by July 2021

Mission critical design review (CDR) is September 2021

Complete telescope by the end of 2021

Cost and schedule commitments are unchanged since beginning of Phase B in 2018, but COVID impacts have liened cost and schedule reserves

- Review of COVID impacts to cost and schedule underway in early 2021

Opportunities for participation in Roman Space Telescope research and support will be offered in ROSES-2021 (next chart)

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

Roman Town Hall (Session 520)
Friday, Jan 15 @ 1:40 pm ET

NASA Science Webinars: Roman Space Telescope
Exoplanet Science: Monday, Jan 11 @ 12:00 pm ET
Wide Field Survey Science: Wed, Jan 13 @ 5:00 pm ET

Roman Space Telescope

Opportunities for participation in Roman Space Telescope research and support will be offered in ROSES-2021

- Key Project Teams: Science teams to conduct scientific investigations using the data from the major surveys identified by the Astro2010 Decadal Survey
- Coronagraph Community Participation Program: Investigators to work with the coronagraph instrument team to plan and execute tech demo observations
- Wide Field Instrument Preparatory Science: Investigators to work on science preparation activities related to mission performance verification and science operations preparation

All Roman observing time is available through open processes

- Major Legacy Surveys will be defined using a community-driven open process
- Key Projects – funded science investigations using these surveys – will be openly competed
- Roman observing time will be available for General Observer (GO) projects
- All data will be available to the community with no period of limited access

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

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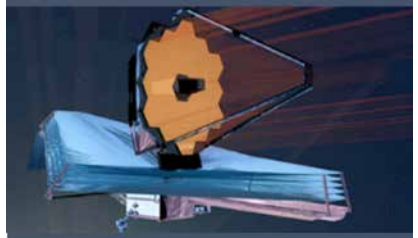
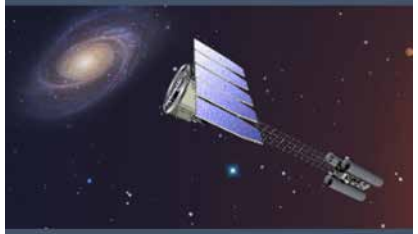
Astrophysics Missions in Development

Webb — 2021
NASA Mission



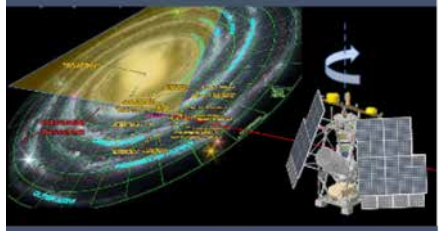
James Webb
Space Telescope

IXPE — 2021
NASA Mission



Imaging X-ray
Polarimetry Explorer

GUSTO — 2021
NASA Mission

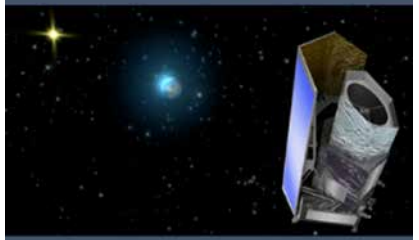


Galactic/ Extragalactic ULDB
Spectroscopic Terahertz Observatory

XRISM — 2022
JAXA-led Mission

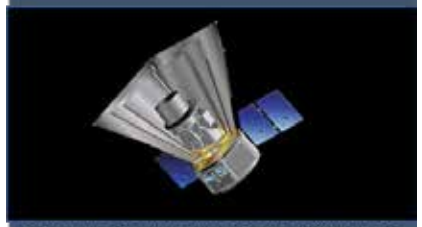
NASA is supplying the SXS
Detectors, ADRs, and SXTs

Euclid — 2022
ESA-led Mission



NASA is supplying the NISP
Sensor Chip System (SCS)

SPHEREx — 2024
NASA Mission

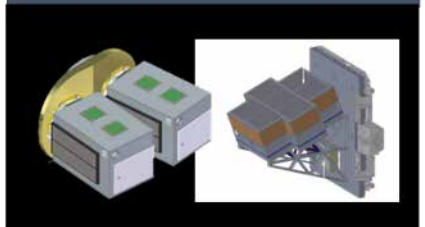


Spectro-Photometer for the History of
the Universe, Epoch of Reionization,
and Ices Explorer

SMEX — ~2025
NASA Mission

COSI or ESCAPE

Mission of Opportunity — ~2025
NASA Mission



Dorado or LEAP

Roman — 2026
NASA Mission

Nancy Grace Roman
Space Telescope

ARIEL — 2028
ESA-led Mission

NASA is supplying the CASE
fine guidance instrument

Launch dates are current project working dates; Agency Baseline Commitment launch date could be later; impacts of COVID-19 not yet known

NASA participation in Athena

ESA's Athena X-ray Observatory

- NASA formal project in 2021/2022
- ESA mission adoption in 2022
- Launch in early 2030s

Opportunities for US scientists

- Join Athena working groups
- Future opportunities
  - US members of Athena science team
  - Guest Observer program

NASA's hardware contributions are in the $100M-$150M range

NASA contributions consist of various enabling technologies:

- X-IFU Focal Plane Detectors and Readout Electronics (GSFC, NIST)
- Use of NASA Testing Facilities and involvement in mirror calibration (MSFC)
- WFI VERITAS ASIC Design (Stanford)
- WFI Background Analysis Model (BAM) Development (PSU, SAO, MIT, Stanford
- Vibration Isolation System (Moog SoftRide)

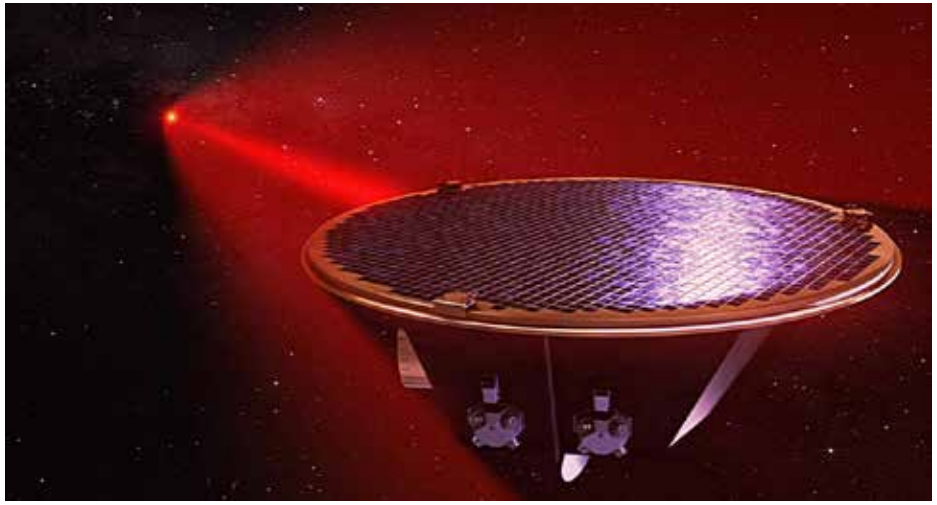
Additional NASA contributions will include:

- Science Ground Segment support
- US Guest Observer Facility
- Guest Observer programs

NASA Athena Science Team

- Co-chairs: L. Brenneman & J. Miller

NASA participation in LISA



ESA's LISA Gravitational Wave Observatory

- NASA formal project in 2022
- ESA mission adoption in 2023
- Launch in mid 2030s

Opportunities for US scientists

- Join the LISA Consortium
- Future opportunities
  - LISA Preparatory Science
  - Guest Investigator program

NASA's hardware contributions are in the $300M-$400M range

NASA contributions consist of various enabling technologies:

- Telescopes (GSFC, U. Florida)
- Laser Systems (GSFC)
- Charge Management Device (U. Florida)

Additional NASA contributions will include:

- Systems engineering support
- Phasemeter design consultation
- Science Ground Segment support
- Preparatory Science programs
- Guest Investigator programs

NASA LISA Study Team

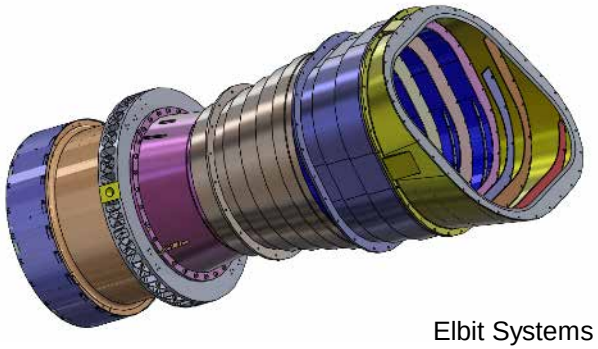
- Chair: K. Holley-Bockelman
- Reports on Technology Assessment (2016), Data Access for U.S. Community (2020)

https://lisa.nasa.gov

NASA participation in UltraSat

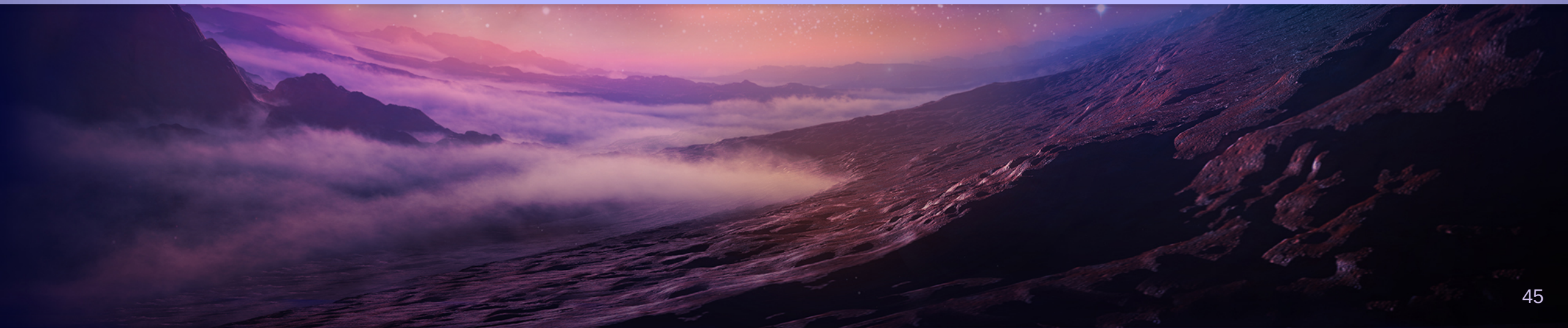
- NASA is joining Israel's UltraSat mission
- UltraSat: a wide-field (>200 sq deg) UV survey & transient detection mission from the Israel Space Agency & Weizmann Institute of Science
  - 50 cm diameter primary mirror
  - Camera contributed by DESY in Germany
  - Launch NET late 2024 for a 3-year mission
- Science: gravitational wave sources, supernovae, variable and flare stars, time domain astronomy, etc.
- Point-and-stare observing plan from super-geostationary orbit
- Transient alerts within <20 min
  - 12-month proprietary non-alert data
- NASA participation:
  - Rideshare launch to GTO
  - Science team membership – competed slots (via ROSES) on Working Groups with full data access during proprietary period
  - Enabling community-wide data analysis through availability in NASA archive & ADAP/XRP
  - Participation in alert definition & protocols

ULTRASAT Concept
Source: Israel Aerospace Industries (IAI)

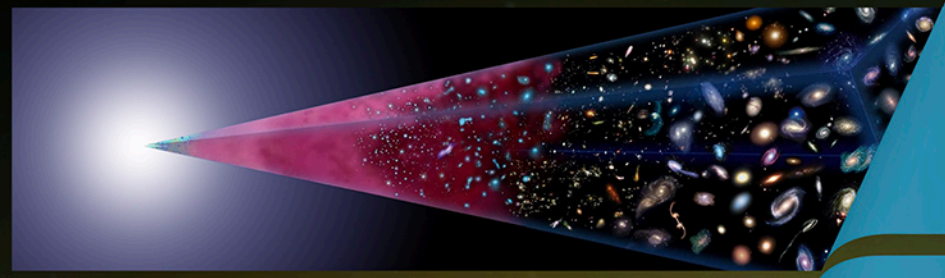


Elbit Systems

Planning for the Future



Why Astrophysics?



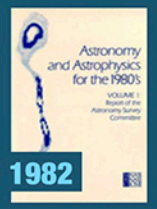
How did our universe begin and evolve?

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

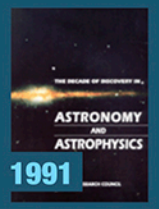
Are we alone?

Enduring National Strategic Drivers

1972



1982



1991

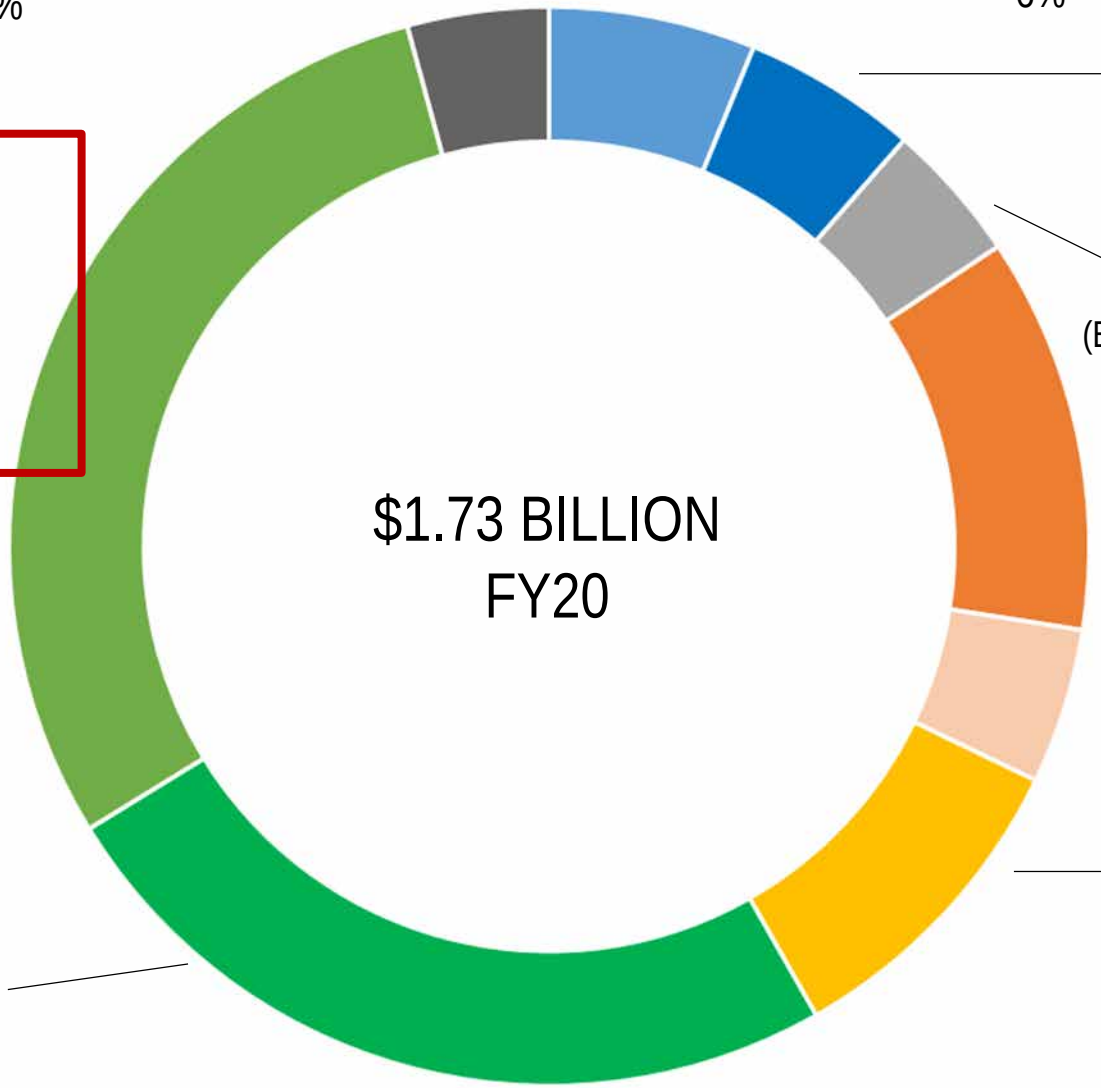
2001

2010


2021

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

Astrophysics Budget – FY20 Plan



MANAGEMENT
INCL. SCIENCE ACTIVATION
4%

RESEARCH
(ADAP, APRA, ATP, ETC.)
6%

TECHNOLOGY
(SR&T, ATHENA, LISA, ETC.)
5%

INFRASTRUCTURE
(BALLOON PROGRAM, ARCHIVES, ETC.)
4%

OP. MISSIONS
(INCL. GO PROGRAMS)
17%

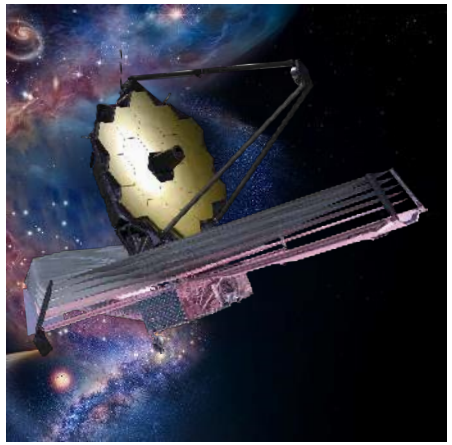
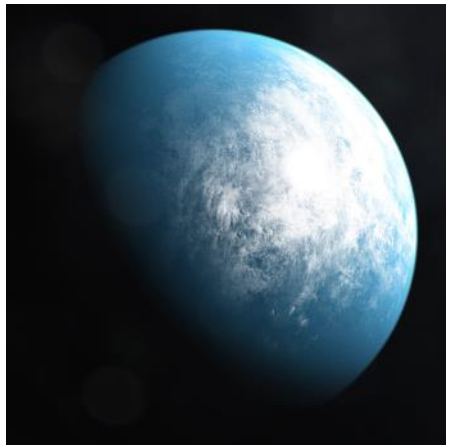
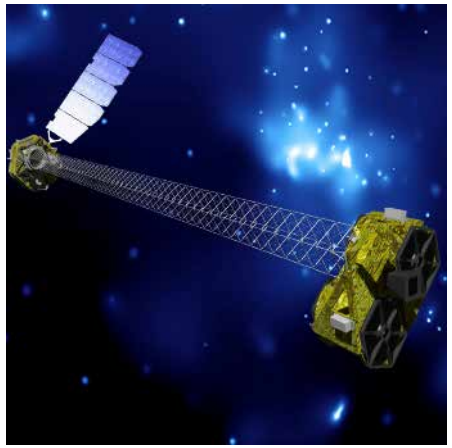
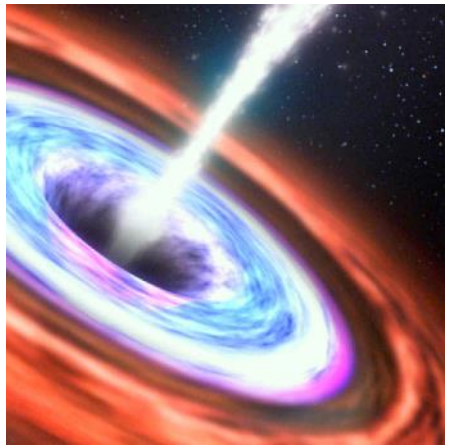
EXPLORERS
DEVELOPMENT
10%

WEBB
DEVELOPMENT
25%

ROMAN
DEVELOPMENT
29%

Quick Summary
Community support: 20%
Operating missions: 12%
Building missions: 64%
Science Activation: 3%

Astrophysics FY21 Appropriation

The FY 2021 NASA Budget Request included no funding for the Roman Space Telescope and only close out funding ($12M) for SOFIA

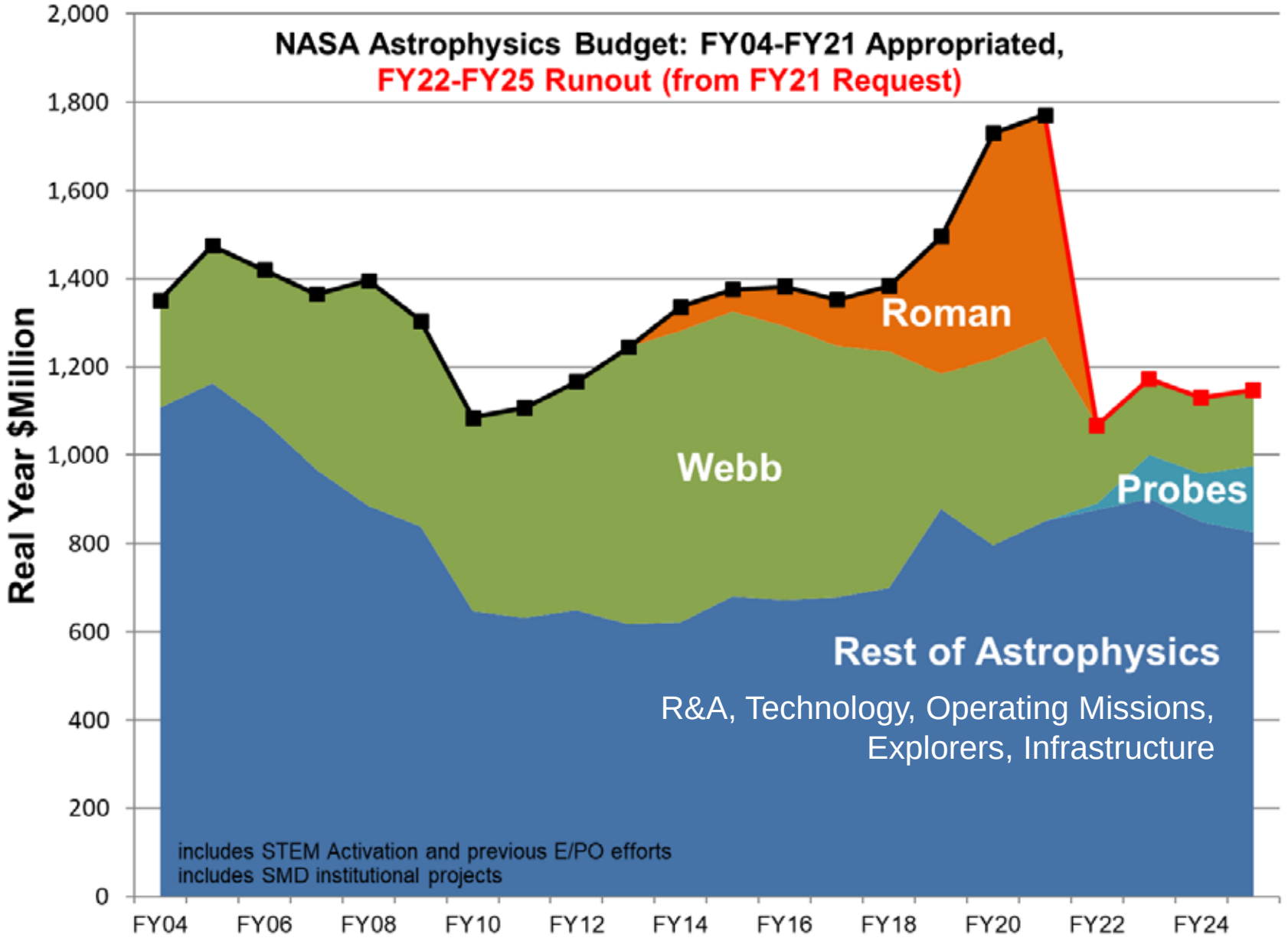
The FY 2021 Omnibus Appropriation Bill

- Provides $1.77B for Astrophysics (including the James Webb Space Telescope)
- Directs $414.7M for Webb, same as the request
- Directs $505.2M for Roman, $505.2M more than the request
- Directs $93.3M for Hubble, $5M more than the request
- Directs $85.2M for SOFIA, $73.2M more than the request
- Directs $10M for “search for life technology development”

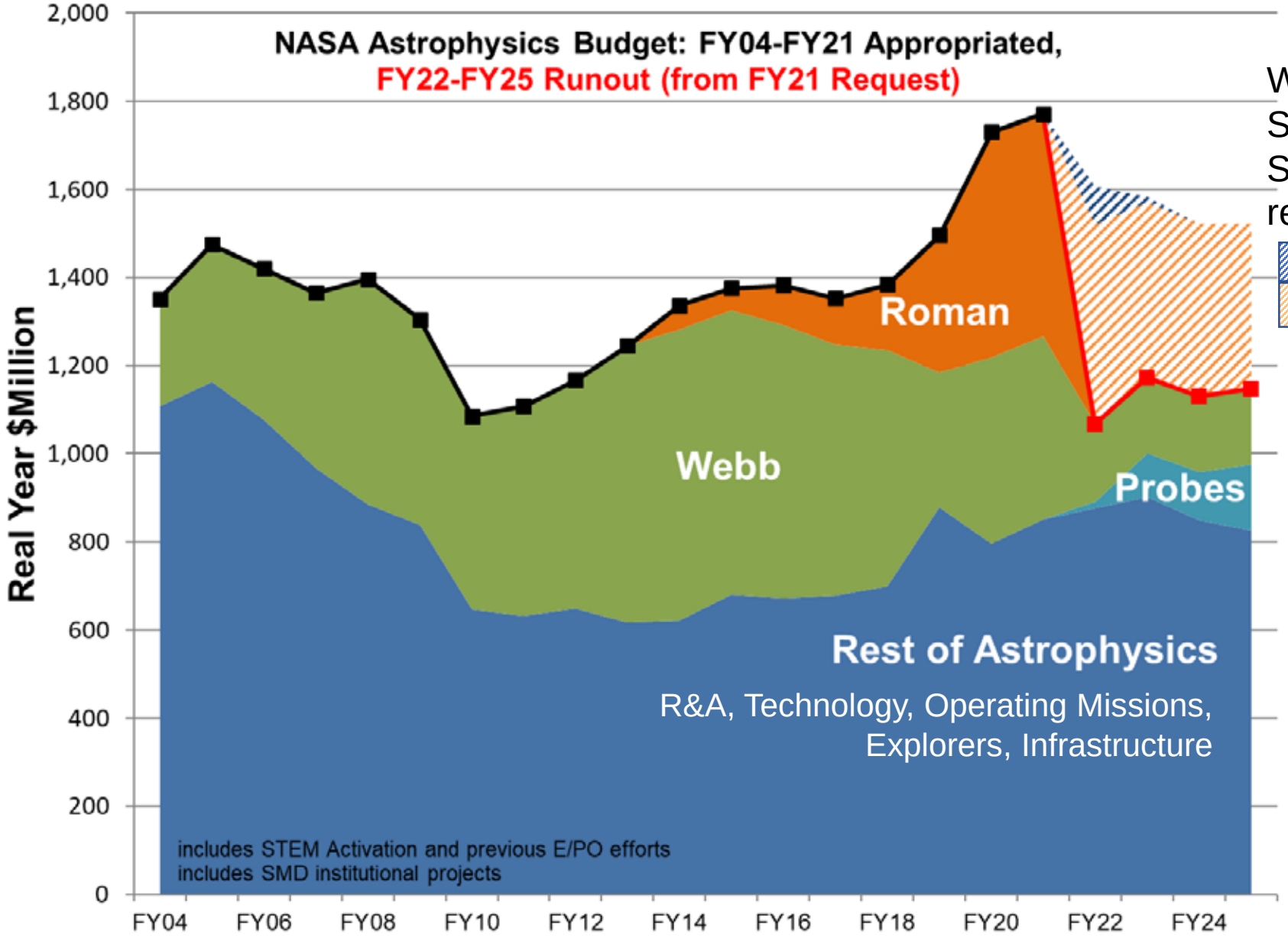
The total funding provided is an increase of $525.2M over the request.

- Does not completely cover the increases for Roman, SOFIA, and Hubble
- Reductions are required from the planned Astrophysics program to accommodate the difference

Astrophysics FY21 Appropriation



Astrophysics FY21 Appropriation

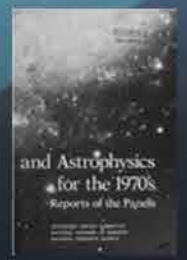


What if the Roman Space Telescope and SOFIA continue to receive appropriations?

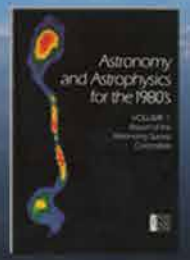
- SOFIA (thru Senior Review)
- Roman

Astrophysics

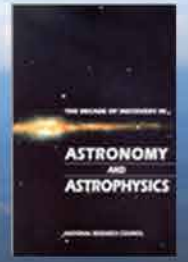
Decadal Survey Missions



1972
Decadal Survey
Hubble



1982
Decadal Survey
Chandra



1991
Decadal Survey
Spitzer

2001
Decadal Survey
Webb

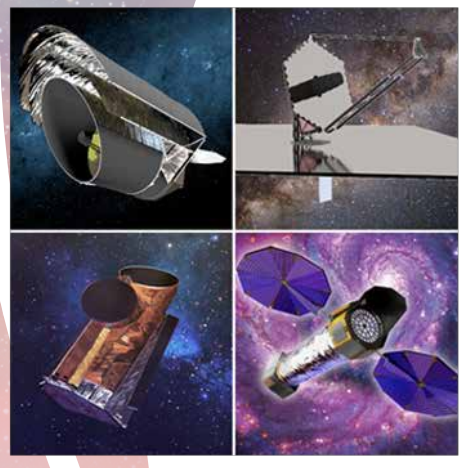
2010
Decadal Survey
Roman

2021
Decadal Survey

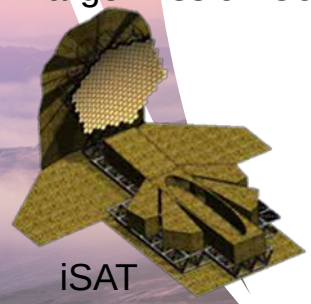
?

Technology Development and Risk Reduction Activities

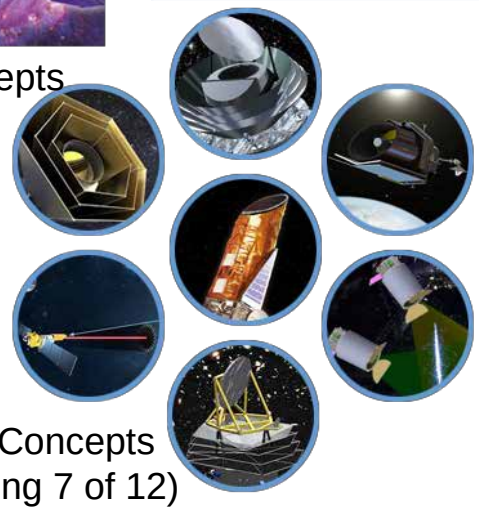
Completed
Large Mission Concept Studies / Probe Mission Concept Studies / In-Space Assembly of Telescopes (iSAT) Study / Large Mission Management Study / STMD Technology Collaborations
Ongoing
Segmented Mirror Technology Program / Binary Star Coronagraph Technology / Deformable Mirrors / Starshade Technology / Extreme Precision Radial Velocity Research and Technology / Detectors (at all wavelengths) / X-ray Mirrors / Cryocoolers
Testbeds (Coronagraph, Ultrastable, X-ray & Cryogenic)
PI-led Strategic Astrophysics Technology (SAT) Advancements



Large Mission Concepts



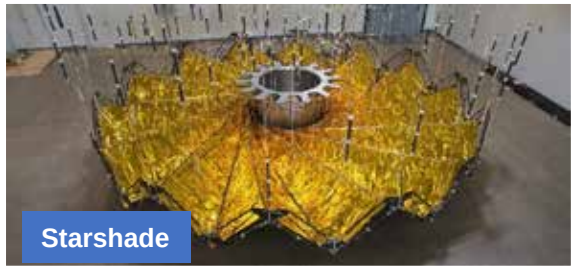
iSAT Concept



Probe Concepts (Showing 7 of 12)

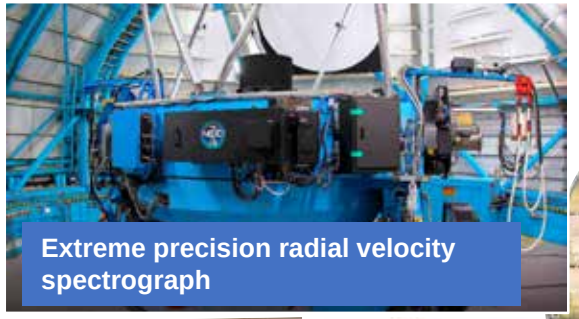
Coronagraph Testbed

Large mirror development

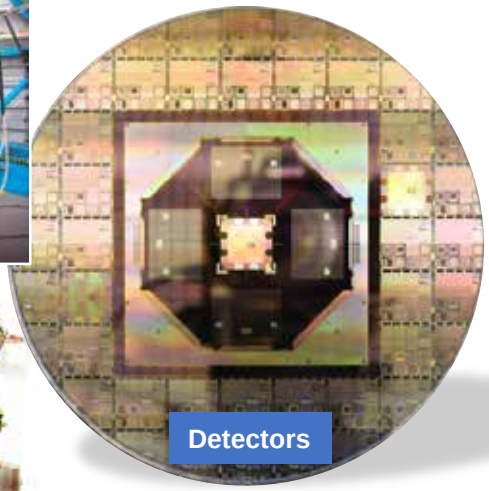


Starshade

X-ray mirror development



Extreme precision radial velocity spectrograph



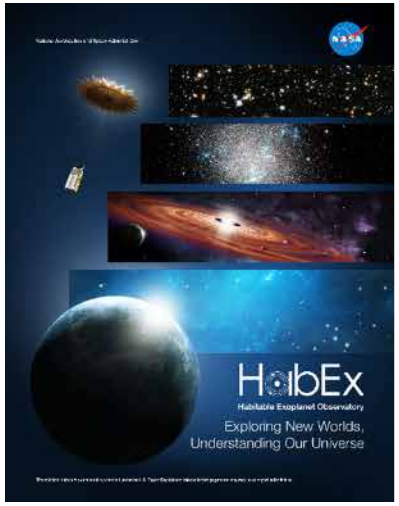
Detectors

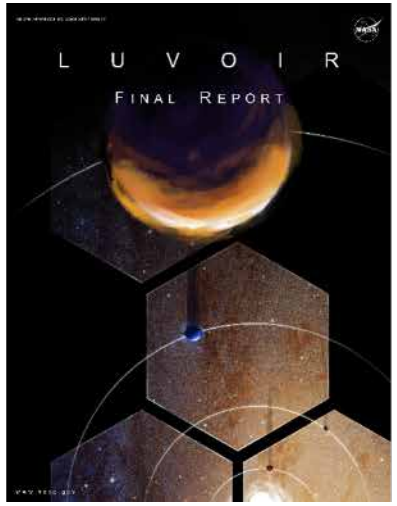
Deformable Mirror

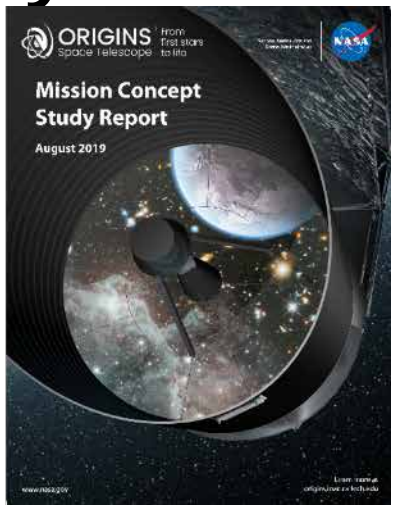
Cryocooler

For more information on technology development activities, see the Astrophysics Technology Development Database (http://www.astrostrategictech.us/)

Astro2020 Decadal Survey Status

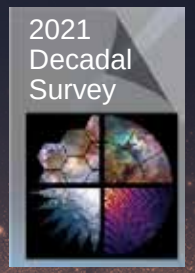




- Large Mission Concept Studies presented to Astro2020 in November 2019
- Probe Mission Concept Studies submitted to Astro2020 in November 2019
- Last public meeting of the Steering Committee on August 25, 2020
  - Agencies presented updated programmatic and budget guidance
  - Co-Chairs stated publicly that report will be delivered by Spring 2021
- NASA is planning ahead for implementing the Decadal Survey
  - Reducing risks of large missions via technology development
  - Planning underway for recommendations in R&A, archives, suborbital, etc.
  - Developing options for Probe and flagship pre-formulation management
  - Holding a wedge in out year planning budget for new initiatives

MARS 2020



DART

Landsat 9

Webb

IXPE

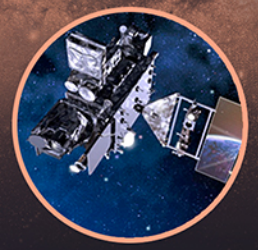
2021 – A Year of Science

O-REx

Peregrine

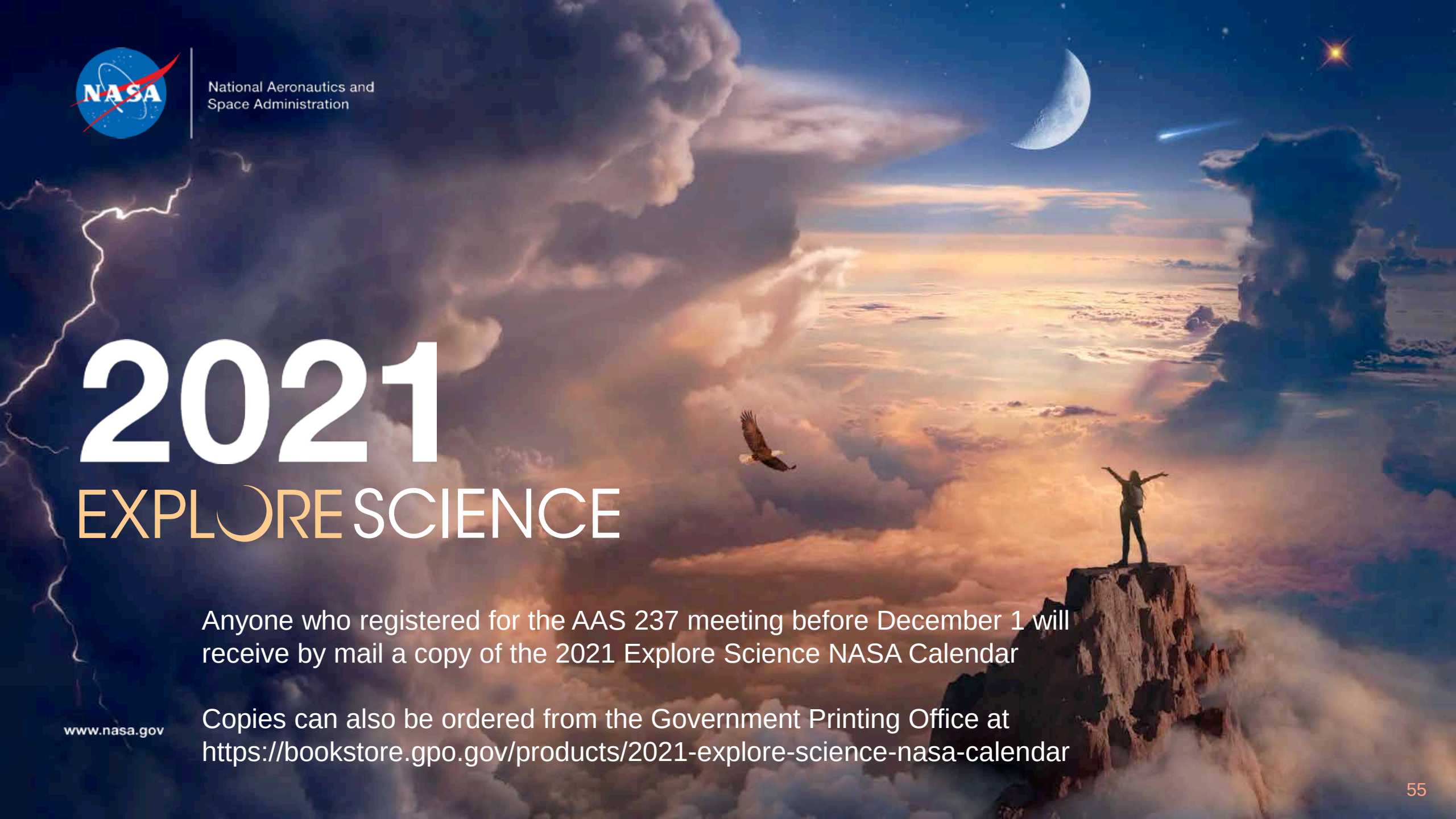
Nova-C

Lucy



GOES-T

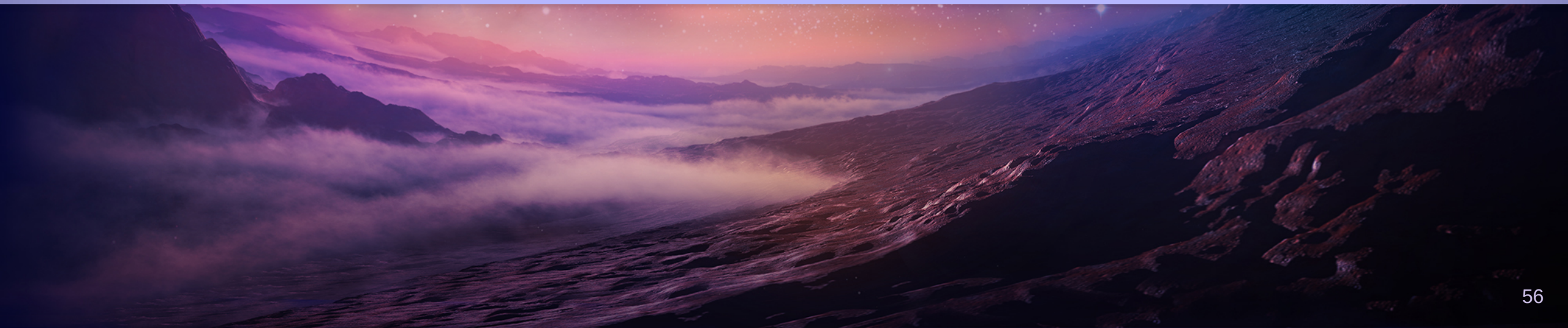
LAUNCH
LANDING
DEPARTURE



Anyone who registered for the AAS 237 meeting before December 1 will receive by mail a copy of the 2021 Explore Science NASA Calendar

Copies can also be ordered from the Government Printing Office at https://bookstore.gpo.gov/products/2021-explore-science-nasa-calendar

Backup



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Dan Evans (eff 2/14/21)

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ACTING DEPUTY ASSOCIATE ADMINISTRATOR
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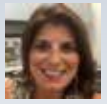

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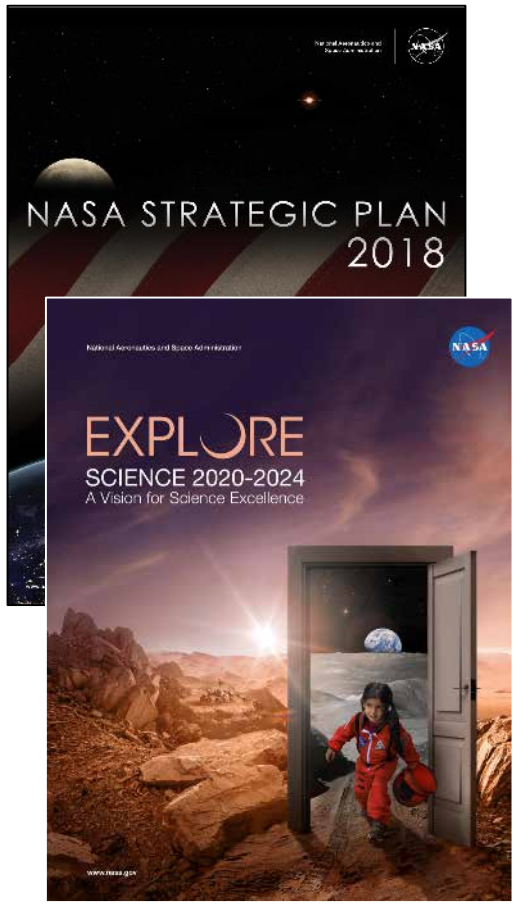
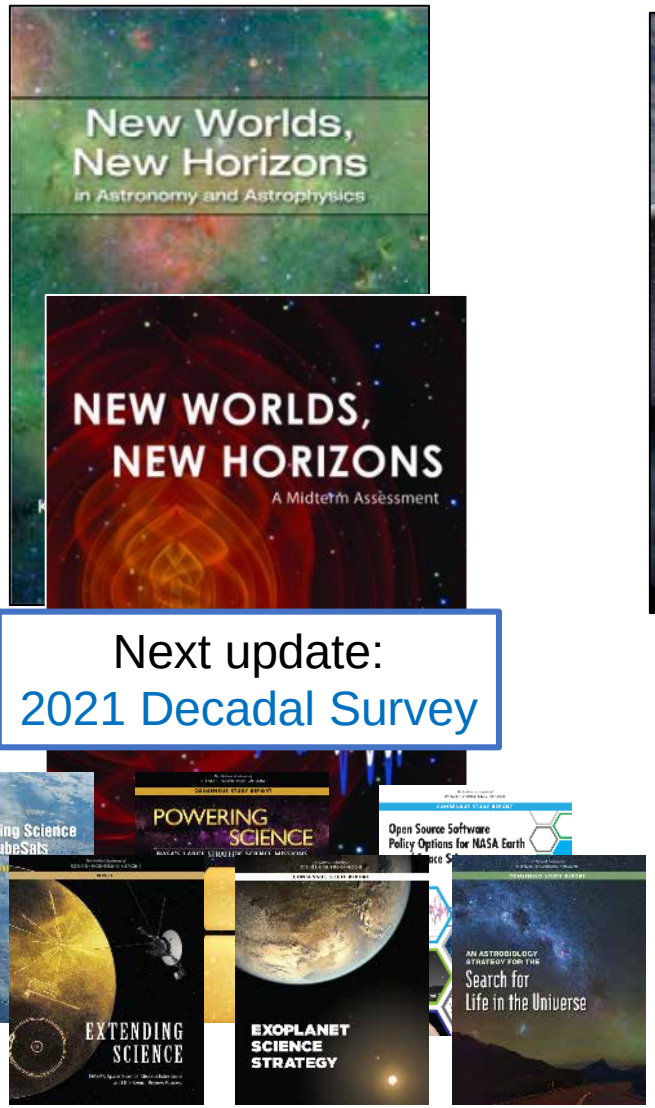
Astrophysics Strategic Planning

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





Next update:
2021 Decadal Survey

Next update:
December 2021
Implementation Plan

Astrophysics FY21 Appropriation

	Request ($M)	Approps. ($M)	Comments
Astrophysics w/ Webb	1,245.7	1770.9	
Webb	414.7	414.7	Development capped at $8.8B
Astrophysics	831.0	1356.2	Increase of $525.2M over request
Roman	0	505.2	Development capped at $3.2B
SOFIA	12.0	85.2	Review mission at appropriate time to determine whether to extend mission
Hubble	88.3	93.3	
Cos Origin		[10.0]	$10M for search for life technology development – included in request, no impact
Sci Act	45.6	45.6	
Everything else	685.1	626.9	$58.2M undistributed reduction

COVID Impacts to Astrophysics Missions in Development

Missions are in launch date order

Webb	Launch delay, cost impacts within reserves, replan approved July 2020
IXPE	Launch delay approved, KDP-D November 2020
GUSTO	Balloon program impact delays certification of super-pressure launch vehicle
XRISM	JAXA announced launch delay
Euclid	ESA maintaining schedule
SPHEREx	Schedule and cost replan approved, KDP-C December 2020
SMEX/MO	Phase A extended to March 2021, further schedule and cost impacts TBD, KDP-B (downselect) fall 2021
Roman	Schedule and cost impacts likely, mission CDR 2021
ARIEL	Too early to tell, KDP-C Fall 2022
Athena	Too early to tell, KDP-A 2021
LISA	Too early to tell, KDP-A 2022

Many missions' launch delay and cost impacts may be covered within project and HQ-held reserves

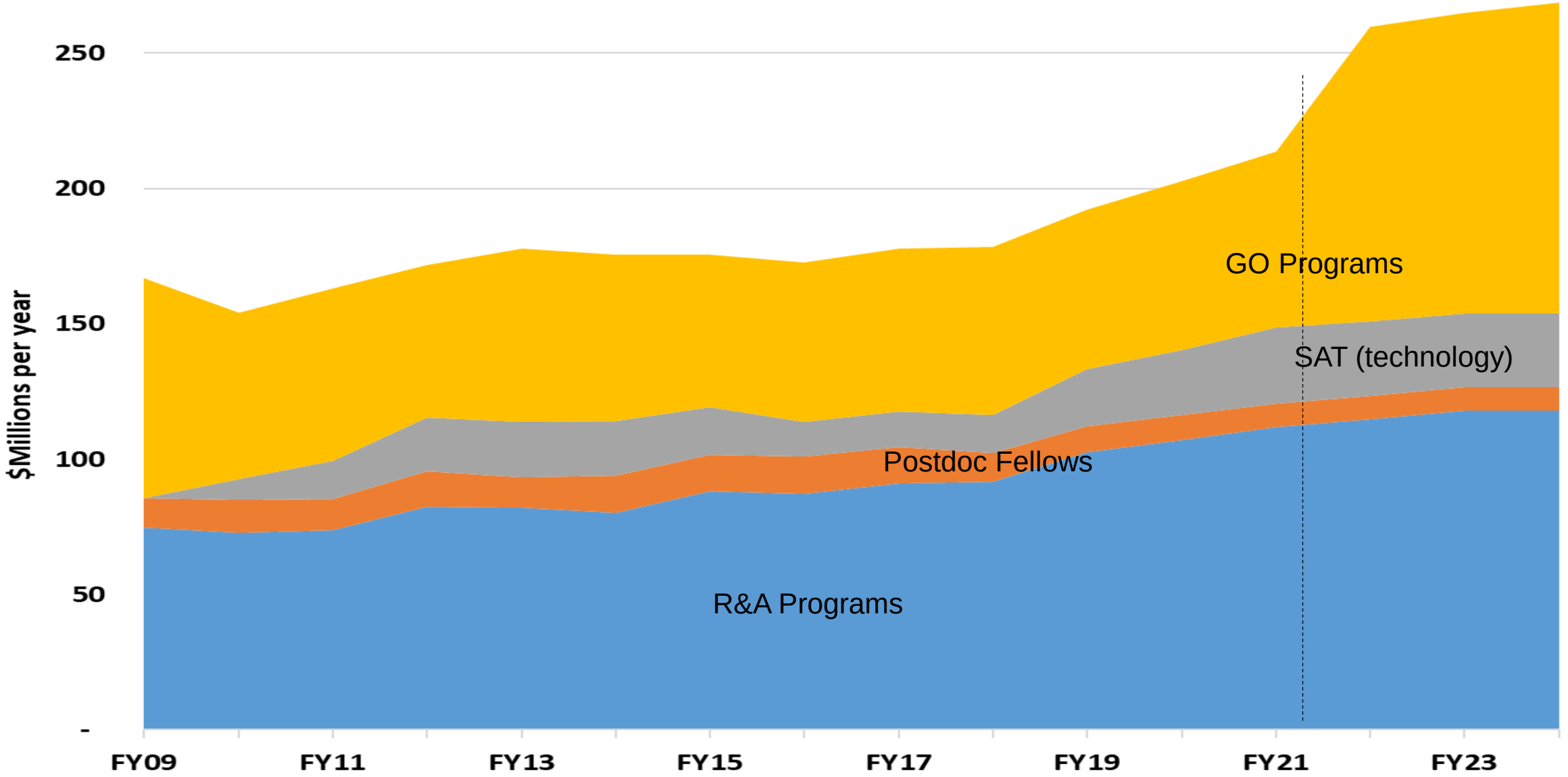
R&A Reviews since the Start of COVID-19

No solicitation was canceled due to COVID-19 and some due dates were postponed to give PIs more time.

R&A Review	Number of Proposals	Selection Rate	New PIs *	PI Notification	Review Format	Comment
FINESST (Graduate Student Awards)	158	13%	N/A	108 days	Virtual	
TESS GI Cycle 3	155	32%	76%	137 days	Virtual	
NuSTAR GO Cycle 6	172	34%	39%	88 days	Virtual + dual anonymous	GO/GI dual anonymous pilot program
Fermi GI Cycle 13	109	38%	24%	126 days	Virtual	
Hubble GO Cycle 28	1,080	18%	33%	86 days	Virtual + dual anonymous	
Chandra GO Cycle 22	520	31%	31%	132 days	Virtual	
Astrophysics SmallSat Studies	32	25%	100%	148 days	Virtual	
TCAN (Theory)	22	18%	100%	97 days	Virtual	
XRP (Exoplanets Research)	153	17%	77%	185 days	Virtual	Cross-Division
ADAP (Data Analysis)	313	13%	82%	141 days	Virtual + dual anonymous	R&A dual anonymous pilot program
Pioneers SmallSat Missions	24	17%	100%	89 days	Virtual	Confirmation gate in 2021

* New PI defined as one who has not been a PI in this program in the past five years

Astrophysics Community Funding



From Open Data to Open Science

All NASA mission science data are public

Publications funded by NASA, including peer review journal articles, are open access and freely available to the public

NASA has initiated an open science data initiative that is making targeted investments in cloud computing, open-source software, Artificial Intelligence/Machine Learning, and open data search and discovery services

- Includes two new ROSES calls targeted at supporting open-source tool development and the opening of legacy software

NASA is developing a policy to ensure that the results of its Federally funded scientific research and technology development are shared openly; this policy will cover:

- Information produced by NASA Science Missions
- Information produced by NASA research awards: includes, but not limited to, experiments, research on sub-orbital platforms, field campaigns, or citizen science projects
- NASA-funded publications, data, and software created in the pursuit of scientific knowledge

Draft will be released for public comment

Zoom chat at NASA booth with Steven Crawford, SMD Open Science Officer
Tuesday, Jan 12 @ 2:40 - 3:10 pm ET

Science Engagement

As a part of SMD's Science Activation (SciAct) program, Astrophysics brings the excitement of the science from its portfolio to provide content to help learners of all ages "do" science.

NASA Science Activation's Next Phase

- Hear from NASA SMD, including Kristen Erickson, Paul Hertz, and Hashima Hasan, and from PI's of Astrophysics SciAct projects.
- Find out how you can participate in as a subject matter expert; come to splinter session or contact the SciAct PI's.

NASA Science Activation Next Phase
Splinter Session
Thursday, Jan 14 @ 4:10 pm ET

Science Activation Zoom Chats
NASA Virtual Booth
Tuesday, Jan 12 @ 2:40 pm ET
Thursday, Jan 14 @ 2:40 pm ET

Citizen Science

Citizen Science is a form of open collaboration in which individuals participate voluntarily in the scientific process – Citizen Science is a science investigation that relies on volunteers

Current projects at https://science.nasa.gov/citizenscience

- Backyard Worlds: Planet 9 project at https://backyardworlds.org announced the first extreme T subdwarfs and most of the known brown dwarfs colder than 500 K
- Planet Patrol launched at https://exoplanetpatrol.org; volunteers help vet exoplanet candidates from the TESS mission

Proposers to any ROSES program element may incorporate citizen science and crowdsourcing methodologies into proposals, where such methodologies advance the proposed investigation

Citizen Science Seed Funding Program in ROSES funds prototyping of citizen science projects offered. ROSES-20 deadline was in December 2020; 18 proposals for Astrophysics

NASA Citizen Science Community Workshop series online will continue in 2021

NASA Science Webinar: Citizen Science
Thursday, Jan 14 @ 4:00 pm ET