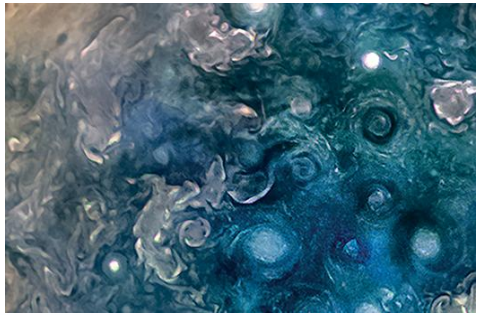
National Aeronautics and Space Administration

SCIENCE

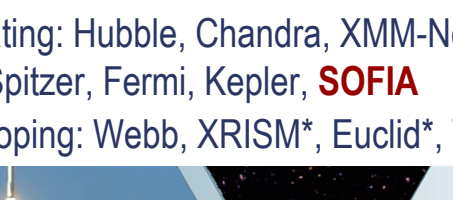



SOFIA International Summit

Kartik Sheth

NASA's Astrophysics Program

Operating: Hubble, Chandra, XMM-Newton*, Spitzer, Fermi, Kepler, **SOFIA**
Developing: Webb, XRISM*, Euclid*, WFIRST



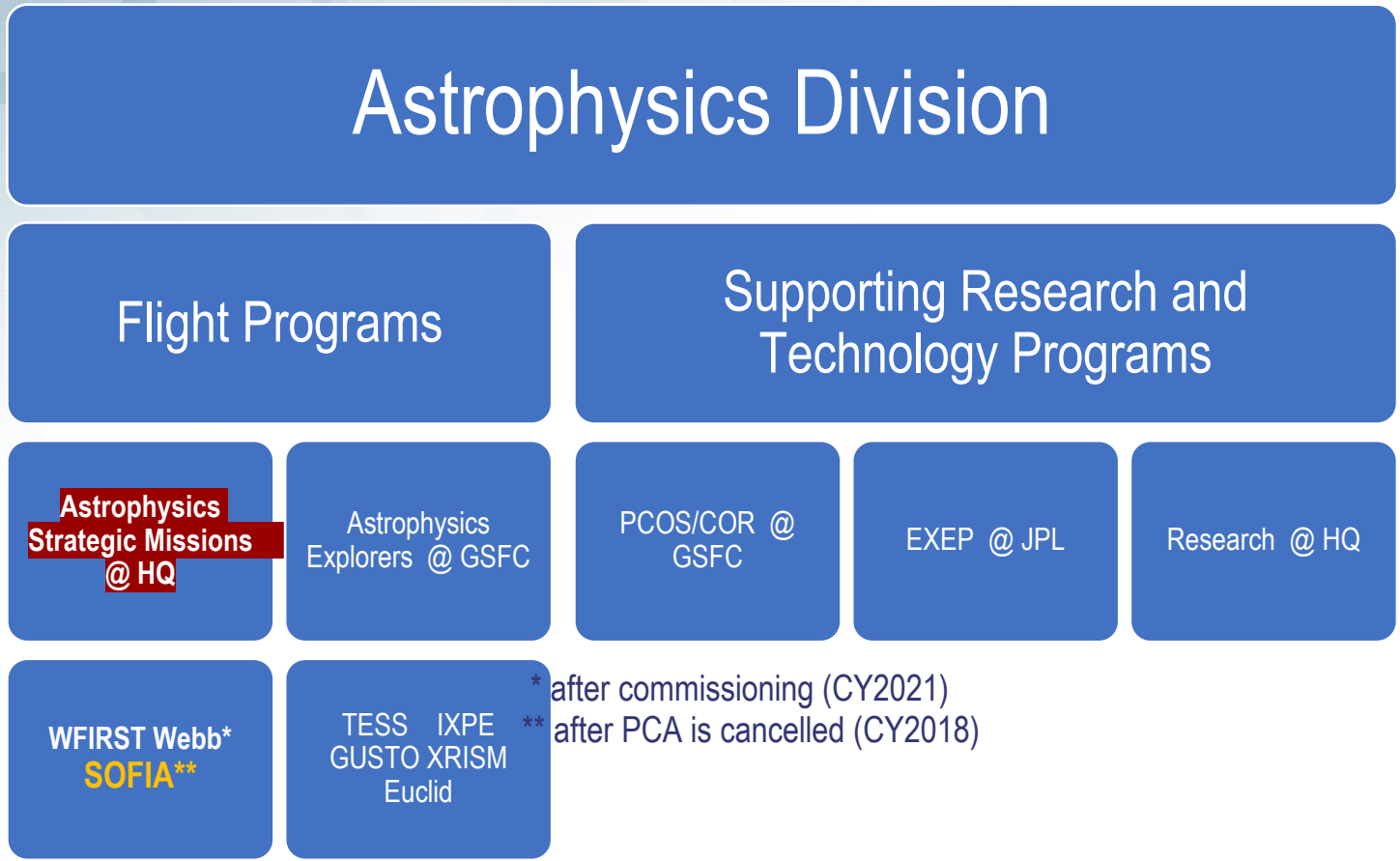
Operating: Gehrels Swift, NuSTAR, NICER, TESS
Developing: IXPE, GUSTO

Phase A Study MIDEX: Arcus, SPHEREx
Phase A Study MO: ARIEL*, COSI-X, ISS-TAO
Pre-Phase A Study: Athena*, LISA*
Decadal Survey Study: HabEx, LUVOIR, Lynx, OST

* Contribution to Partner-led Mission

- **Strategic Missions**
  - Flagships and Probes led by NASA
  - Contributions to Partner-led Missions
- PI-led (competed) Missions
  - Explorers Missions (small and medium)
  - Contributions to Partner-led Missions
- Supporting Research and Technology
  - Research and Analysis
  - Technology Development
  - Suborbital Payloads (Balloons, Sounding Rockets)
  - CubeSats and ISS-attached Investigations
- Infrastructure and Management
  - Data Archives
  - Balloon Program
  - Mission Studies

Astrophysics Program Offices (after restructuring)



Major Accomplishments: April – July 2018

- Transiting Exoplanet Survey Satellite (TESS) launched April 2018
- SOFIA returned to science operations following extended maintenance period May 2018
- GUSTO completed System Requirements Review May 2018
- WFIRST passed KDP-B May 2018 and began preliminary design phase (Phase B); funds appropriated by Congress in FY18 allow WFIRST to begin Phase B
- Palestine balloon campaign flew two missions (SuperBIT, ASCOT) May-July 2018
- Sweden balloon campaign flew 3 missions (AESOP-lite, HiWIND, PMC Turbo) May-July 2018
- First NASA astrophysics CubeSat (HaloSat) launched May 2018, deployed July 2018
- IXPE completed Preliminary Design Review June 2018
- NASA submitted Webb replan cost and schedule report to Congress based on results of WIRB report June 2018
- TESS entered science operations August 2018
- Ft. Sumner balloon campaign underway August-October 2018
- Euclid sensor chip electronics (SCE) recovery plan approved September 2018

Planned Accomplishments August 2018 – June 2019

- IXPE will enter Phase C October 2018
- SOFIA Operations and Maintenance Review will be conducted in late 2018
- Kepler completes its amazing mission when the fuel is exhausted TBD 2018
- Antarctic balloon campaign will be conducted December 2018 – February 2019
- Next Astrophysics MIDEX and Mission of Opportunity will be downselected January 2019
- Astrophysics Decadal Survey will begin January 2019
- SOFIA Five Year Review will be conducted early 2019
- Astrophysics Senior Review will be conducted Spring 2019
- Next Astrophysics SMEX and Mission of Opportunity AO will be released in Spring 2019
- Large Mission Concept Studies will be submitted to Decadal Survey Summer 2019

Astrophysics Budget Overview

- **The FY18 consolidated appropriation provides funding for NASA Astrophysics to continue its planned programs, missions, projects, research, and technology.**
  - Total funding provided for FY18 (Astrophysics including Webb) rises from $1.352B in FY17 to $1.384B in FY18, an increase of ~$32M (2.4%) from FY17.
  - NASA Astrophysics FY18 appropriation funds Webb for progress toward launch, WFIRST formulation into Phase B, Explorers mission development and MIDEX/MO Phase A, increased funding for R&A, continued operating missions, suborbital missions and CubeSats, technology development, and mission studies.
  - The NASA Astrophysics FY18 appropriation prohibits NASA from placing SOFIA into the Senior Review.
  - $10M (2.2%) reduction in rest of Astrophysics to accommodate directed spending increases for WFIRST, Hubble, and SOFIA; accommodated by reducing carryover for operating missions (requires FY19 payback).
- **The FY19 budget request proposes a reduced level of funding for NASA Astrophysics.**
  - Total requested funding for FY19 (Astrophysics including Webb) is ~$1.185B, a reduction of $200M (14%) from FY18 appropriation.
  - Webb included as project within Astrophysics budget, integration and testing continues toward launch.
  - Given its significant cost within a proposed lower budget for Astrophysics and competing priorities within NASA, WFIRST is terminated with remaining WFIRST funding redirected towards competed astrophysics missions and research.

Astrophysics Budget – FY19 Appropriations

($M)	Admin Request	House Markup	Senate Markup	Comments
Astrophysics (w/ Webb)	1,185.4	1,333.6	1,547.8	Senate: Start Astro2020 on time
Webb	304.6	304.6	304.6	Both: $8B cost cap
Hubble	78.3		98.3	Senate: Reject cutting costs
SOFIA	74.6	85.2		House: No Senior Review Senate: Encourage Senior Review
WFIRST	0.0	150.0	352.0	House: $20M for starshade tech Both: $3.2B cost cap
R&A	83.4	83.4		
Science Activation	44.6	44.0	45.0	
Technosignatures	0.0	10.0		
Search for Life Tech	>>15.0		15.0	
Rest of Astrophysics	678.2	656.4		-21.8 (-3.2%)

Astrophysics Research and Analysis (R&A) Elements

Supporting Research and Technology

- Astrophysics Research & Analysis (APRA)
- Strategic Astrophysics Technology (SAT)
- Astrophysics Theory Program (ATP) (not 2018)
- Theoretical and Computational Astrophysics Networks (TCAN)
- Exoplanet Research Program (XRP)
- Roman Technology Fellowships (RTF)
- SmallSat Studies

Data Analysis

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

Mission Science and Instrumentation

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

Separately Solicited

- GO/GI/Archive/Theory programs for:
  - Chandra
  - Hubble
  - **SOFIA**
  - Spitzer
  - Webb
- NASA Hubble Fellowship Program
- Graduate Student Fellowships (NESSF)

Proposal Status Update

GO Selection Rate = 32%

R&A Selection Rate = 20%

Status: Sep 18, 2018

Average: 106 days (44 – 148 days)
80% PIs notified: 89 days

Solicitation	Proposal Due Date	Notify Date	Days since received	Number received	Number selected	% selected	
Hubble GO – Cycle 25	Apr 7, 2017	June 26, 2017	80	971	271	28%	
Exoplanet Research	May 25, 2017	Oct 8, 2017	136	50	9	18%	
SOFIA GI – Cycle 6	**June 30, 2017**	**Nov 7, 2017**	**130**	**198**	**104**	**53%**	*
Astrophysics Theory	July 27, 2017	Dec 22, 2017	148	216	53	25%	
Webb Early Release Science	Aug 18, 2017	Nov 13, 2017	87	106	13	12%	
Swift GI – Cycle 14	Sep 28, 2017	Jan 13, 2018	140	146	30	21%	
TESS – Cycle 1	Oct 6, 2017	Feb 3, 2018	132	143	38	27%	
K2 – Cycle 6 (Phase 2)	Apr 19, 2018	June 25, 2018	67	41	23	56%	
NESSF-18	Feb 1, 2018	May 15, 2018	103	177	8	5%	
Chandra GO – Cycle 20	Mar 16, 2018	July 16, 2018	122	526	156	24%	
XARM Participating Scientist	Dec 13, 2017	Feb 21, 2018	64	39	5	13%	
NuSTAR – Cycle 4	Jan 19, 2018	April 17, 2018	88	196	83	42%	
TCAN	Jan 26, 2018	June 21, 2018	146	32	3	9%	
Segmented Telescope Design	Feb 1, 2018	Mar 16, 2018	44	5	2	40%	
Fermi GI – Cycle 11	Feb 23, 2018	May 26, 2018	92	138	42	30%	
Spitzer GI – Cycle 14	Mar 23, 2018	May 29, 2018	67	116	50	43%	
SAT (Technology)	Mar 19, 2018	Aug 14, 2018	148	25	8	35%	
APRA (Basic Research)	Mar 19, 2018	Aug 14, 2018	148	170	35	21%	
SmallSat Studies	Jul 13, 2018	Sep 10, 2018	59	38	9	24%	
ADAP (Data Analysis)	May 17, 2018	Sep 18, 2018	124	242	42	17%	

NASA Astrophysics

Missions Update: TESS, Webb, WFIRST, Explorers, SmallSats, Athena/LISA, SOFIA, Senior Review

SOFIA

Stratospheric Observatory for Infrared Astronomy

- SOFIA's initially agreed upon 5-year prime mission will be completed at the end of FY19
- At the end of a prime mission, NASA usually assesses the science performance, management of a program and proposed future science to decide on an extension of the program through a Senior Review Process, as required by the 2005 NASA Authorization Act.
- The 2018 Consolidated Appropriations Act, however forbade NASA from placing SOFIA in the 2019 Senior Review.
- Given that the program has finished 5 years of operations, the time is appropriate to review 2 aspects of the SOFIA Project:
  - A review of SOFIA's science progress and science prospects to assure that SOFIA is and will remain scientifically productive and relevant (early 2019)
  - A review of SOFIA's operational paradigm to assure that SOFIA is optimally efficient and effective in planning and executing the science program (late 2018)
  - **The reviews will not consider closeout or cancellation of SOFIA.**

Senior Review 2019

- Astrophysics Advisory Committee
  - Senior Review Subcommittee
    - Hubble Panel
    - Chandra Panel
    - Rest-of-Missions Panel

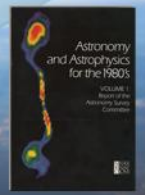
- Chandra X-ray Observatory (Chandra)
- Fermi Gamma-ray Space Telescope (Fermi)
- Hubble Space Telescope (Hubble)
- Neutron star Interior Composition ExploreR (NICER)
- Nuclear Spectroscopic Telescope Array (NuSTAR)
- Neil Gehrels Swift Observatory (Swift)
- Transiting Exoplanet Survey Satellite (TESS)
- X-ray Multi-mirror Mission-Newton (XMM-Newton)

Not in Senior Review: Kepler, SOFIA, Spitzer

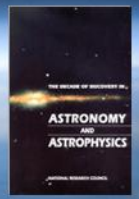
Astrophysics

Decadal Survey Missions

1972
Decadal Survey
Hubble



1982
Decadal Survey
Chandra



1991
Decadal Survey
Spitzer, SOFIA

2001
Decadal Survey
JWST

2010
Decadal Survey
WFIRST