National Aeronautics and Space Administration

Astrophysics Subcommittee

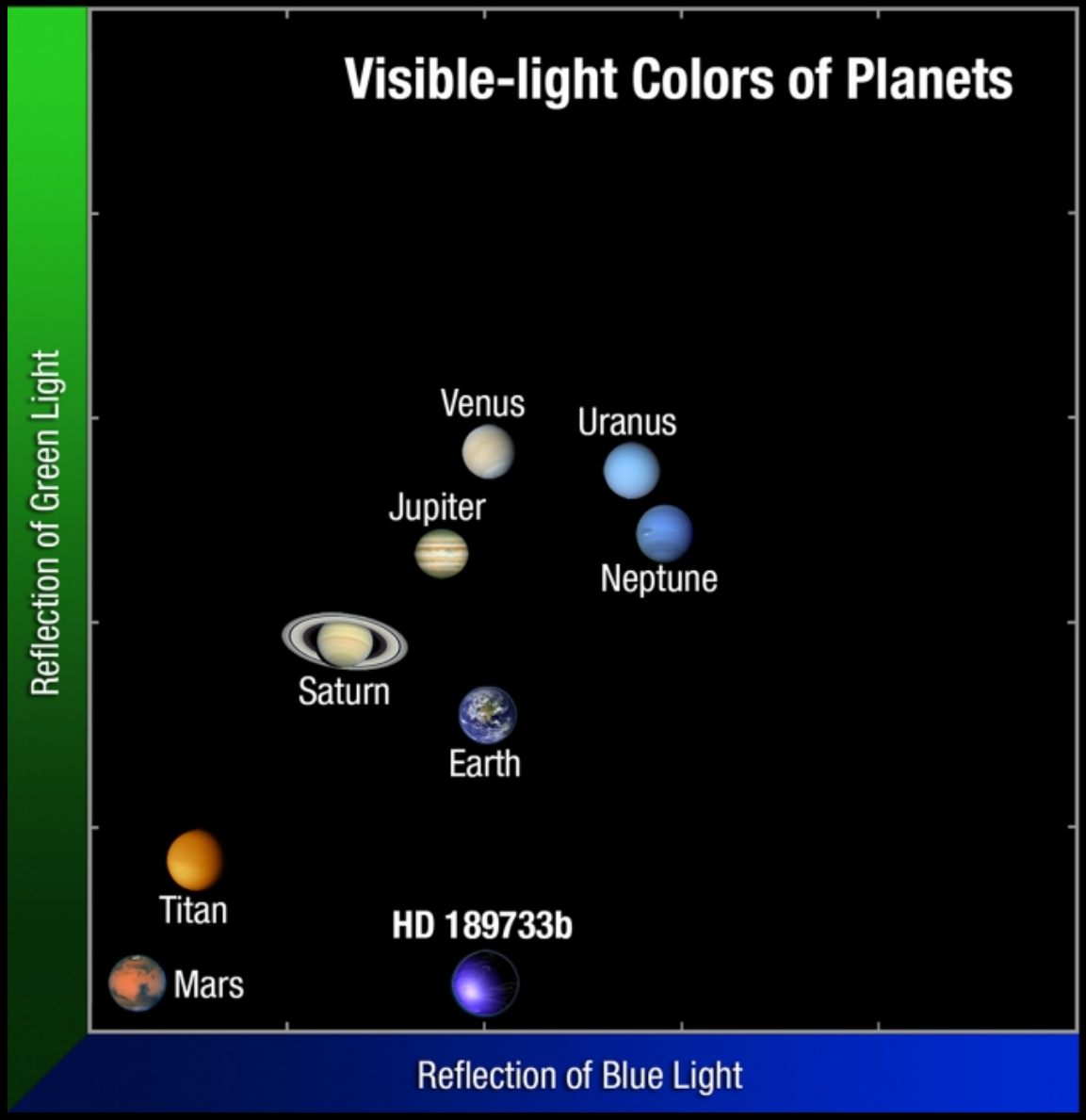
July 16, 2013

Astrophysics

Paul Hertz

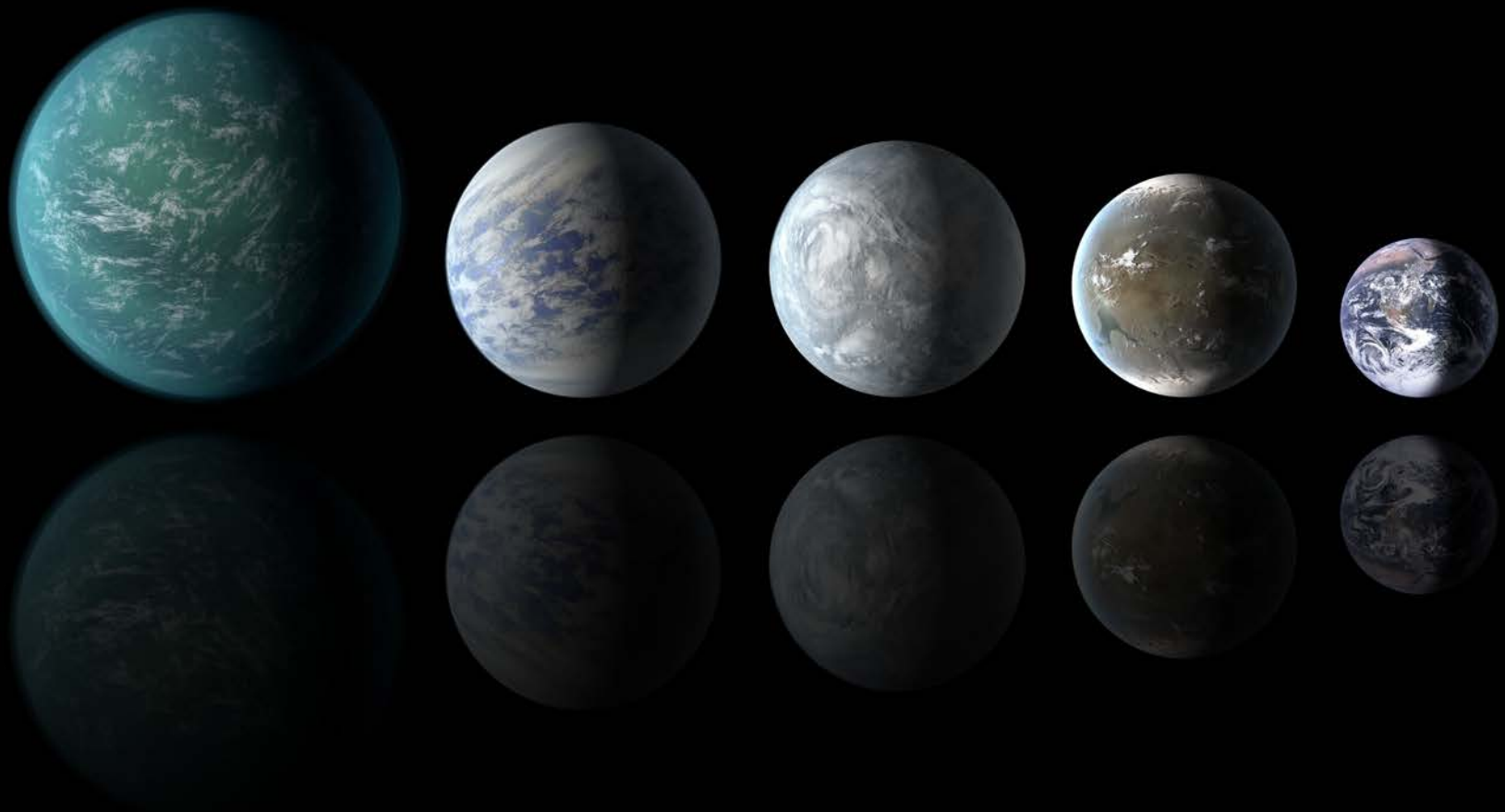
Director
Astrophysics Division
Science Mission Directorate

Hubble Finds a True Blue Planet



Credit: NASA, ESA, and A. Feild (STScI)

This plot compares the colors of planets in our solar system to exoplanet HD 189733b. The exo-planet's deep blue color may be produced by silicate droplets, which scatter blue light in its atmosphere.



Artist concept: NASA Ames/JPL-Caltech.

esa

→THE ORION B MOLECULAR CLOUD AND THE HORSEHEAD NEBULA

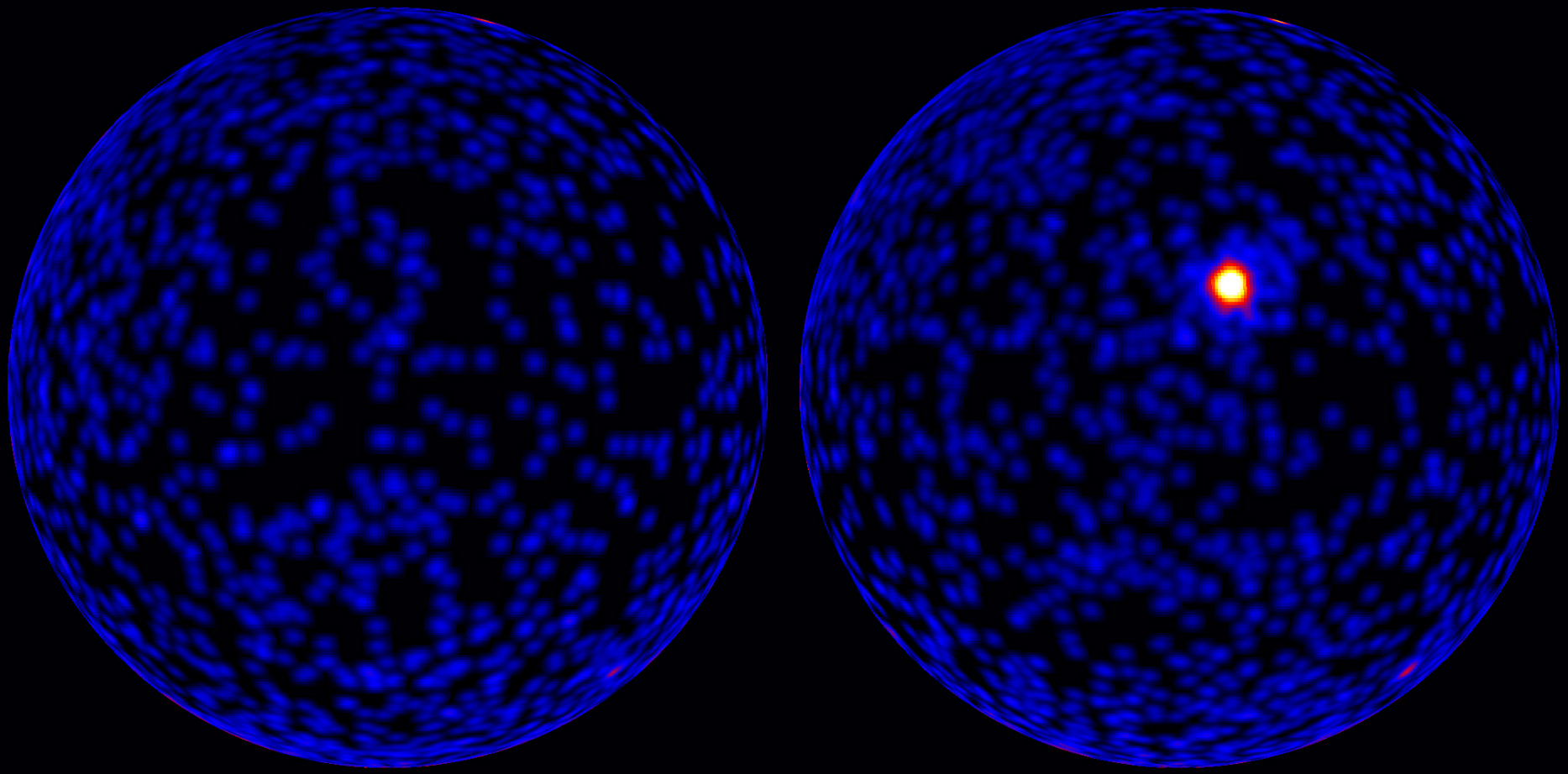
Far-infrared

Near-infrared

Visible

www.esa.int

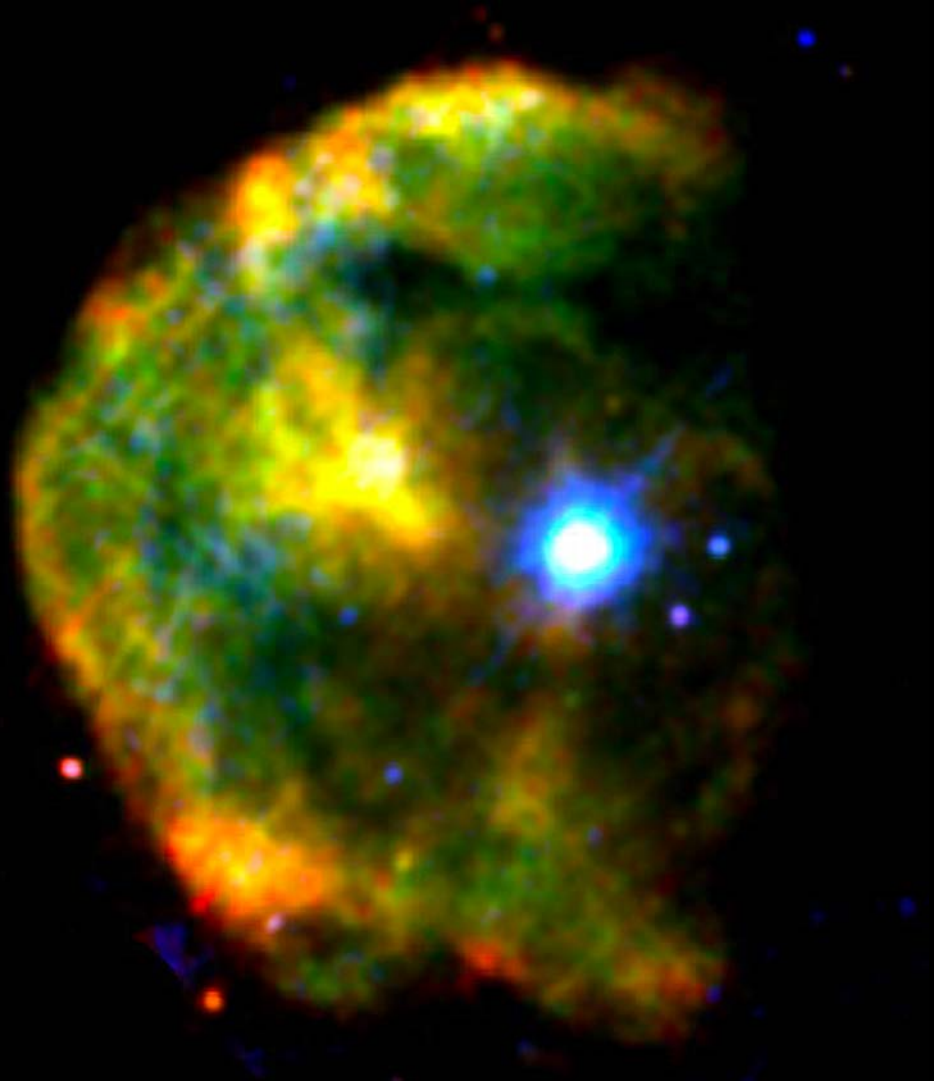
European Space Agency



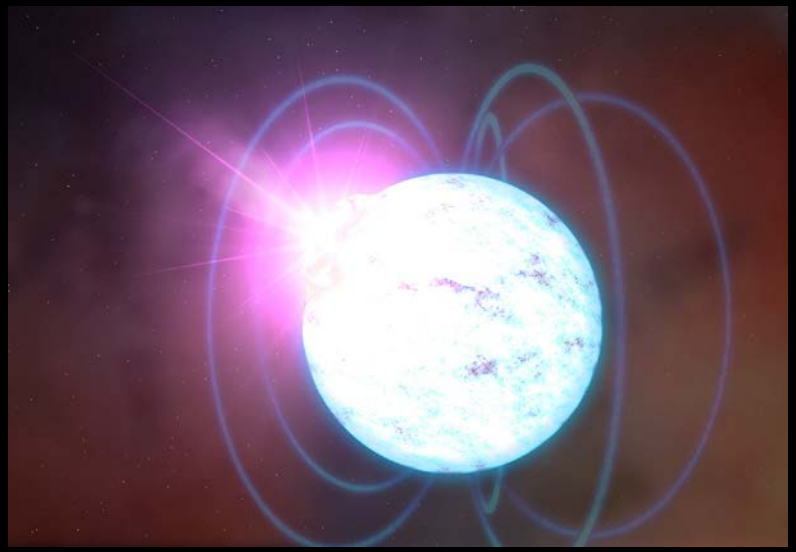
Before and after Fermi LAT views of GRB 130427A, centered on the north galactic pole

Credit: NASA/DOE/Fermi LAT Collaboration

Swift observed an anti-glitch in the magnetar 1E2259+586



XMM-Newton image of CTB 109



Artist's conception of a magnetar glitching

Outline

- Division Update
  - Results of NASA's studies of potential use of the 2.4m telescope assets
  - Operating missions including Kepler
  - Missions in development
  - Research selection rates
- President's FY14 Budget Request for NASA Astrophysics
  - Update on FY13 Appropriation
  - President's FY14 Budget Request
  - Astrophysics Implementation Plan and Roadmap
- Questions and Answers


Formulation
Implementation
Primary Ops
Extended Ops
XMM-Newton (ESA)
12/10/1999
Swift
11/20/2004
Suzaku (JAXA)
7/10/2005
Fermi
6/11/2008
Euclid (ESA)
2020
Planck (ESA)
5/14/2009
Spitzer
8/25/2003
Hubble
4/24/1990
Kepler
3/6/2009
Astro-H (JAXA)
2015
JWST
2018
Chandra
7/23/1999
NICER (on ISS)
2016
NuSTAR
6/13/2012
TESS
2017
LISA Pathfinder (ESA)
2015
SOFIA
Full Ops 2014
Astrophysics Division Update
Recently Completed
Herschel 2013
GALEX 2013

The Big Picture…..

- **This remains a time of opportunity for NASA Astrophysics**
  - The President's request for the FY14 NASA astrophysics budget, which includes JWST, remains at a high level.
  - Large and small space-based observatories spanning the electromagnetic spectrum, including multiple Great Observatories, are currently observing the universe.
  - The James Webb Space Telescope, the highest priority of the community, is on schedule and fully funded for an October 2018 launch.
  - Two new Explorer projects have been downselected and are beginning development for launch in this decade.
  - Individual investigators continue to be supported through open, competitive, peer reviewed solicitations.
  - We are preparing for the strategic mission that will be developed following JWST.
- **The budgetary future remains uncertain**
  - FY13 rescission and sequester has an impact.
  - Constrained budget request for FY14 and planning budget for FY15-FY18 means priorities must be set and choices must be made.
  - Sequestration below President's request in FY14 will require program reduction.

NASA use of 2.4m Telescope Assets for WFIRST

- Since Fall 2012, NASA has been studying potential uses of the 2.4m telescope assets that were made available to the Agency by the National Reconnaissance Office in mid-2012.
- The studies included both (1) whether the telescope assets could be used to realize a mission that responds to the number one recommendation of the Astrophysics Decadal Survey for a wide field infrared survey telescope (WFIRST) and (2) an assessment of possible applications to other NASA objectives in science, technology, and human space flight.
- The results of the studies were presented to the NASA Administrator and other senior officials across the Agency on May 30, 2013.
- The focused astrophysics study showed that for approximately the same costs, the telescope assets would enable a WFIRST mission with significantly improved science capabilities relative to the design described in the Astrophysics Decadal Survey.
- Use of the telescope assets would also enable the addition of an exoplanet imaging instrument to WFIRST that would enable imaging and characterization of planets around nearby stars up to a decade earlier than contemplated in the Decadal Survey.

NASA use of 2.4m Telescope Assets for WFIRST

- The Administrator directed the Science Mission Directorate to continue pre-formulation activities for a mission using the 2.4m telescope assets to prepare for a later decision as to whether a WFIRST mission would be undertaken with these optics.
- No decision on a future wide field infrared survey mission is expected until early 2016.
- There was no decision to proceed with design studies for any other concepts at this time.
- The study report by the Science Definition Team is available at: http://wfirst.gsfc.nasa.gov/science

AFTA Study: Strawman Payload

2.4m Telescope with wide field-of-view

Wide-Field Instrument

- *Imaging & spectroscopy over 1000s sq deg.*
- *Monitoring of SN and microlensing fields*
- 0.7 – 2.0 micron bandpass
- 0.28 sq deg FoV (100x JWST FoV)
- 4 filter imaging, grism + IFU spectroscopy
- 18 H4RG detectors (288 Mpixels)

Requires focused tech. development

Coronagraph (study option)

- *Imaging of ice & gas giant exoplanets*
- *Imaging of debris disks*
- 400 – 1000 nm bandpass
- 10^{-9} contrast
- 100 milliarcsec inner working angle at 400 nm

Requires focused tech. development

AFTA Study: Findings of SDT

AFTA carries out the WFIRST science program (the top ranked decadal priority).

+

AFTA's larger aperture enables astronomers to make important contributions towards many of the enduring questions listed in the decadal survey through both surveys and peer-reviewed observing programs.

+

Equipped with a coronagraph, AFTA can image Jupiter and Saturn-like planets around the nearest stars. AFTA will be an essential stepping stone towards finding signs of life around nearby stars.

AFTA Study: Conclusions

AFTA is well matched to the WFIRST Requirements.

- Existing Hardware: high quality mirror and optical system.
- Easily used in Three Mirror Anastigmat.
  - Wide field of view
  - 3rd mirror in Wide-Field Imager primary instrument
- AFTA's 2.4 m aperture + Wide Field Imager meets (and exceeds) WFIRST requirements:
  - Higher spatial resolution enhances science capability.
  - Larger collecting area enables more science in fixed time.
- With a coronagraph as a second instrument, AFTA's 2.4m aperture enables richer scientific return at much lower cost than a dedicated smaller coronagraphic telescope mission.

Study concluded that use of these telescope assets satisfy all mission requirements for WFIRST.

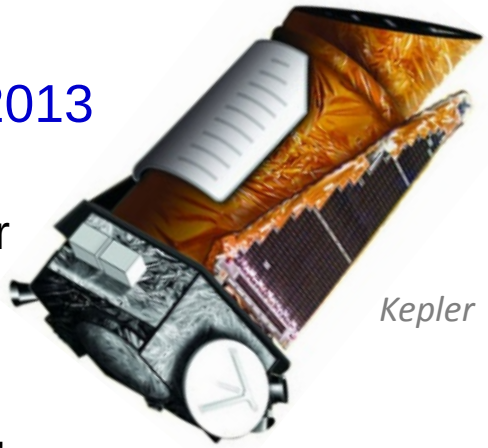
AFTA Study: Near-Term Activities

- Current SDT is being reconvened with new charter and additional members.
  - Co-Chairs are David Spergel (Princeton) and Neil Gehrels (GSFC).
  - Next face-to-face meeting is Sept 9-10 at GSFC.
- APD down-selects to 2 coronagraph technologies for further development – decision by December 2013.
  - SDT to deliver coronagraph science drivers analysis, due September 2013.
  - ExEP PO and AFTA Study Office coronagraph technology downselect recommendations due to APD November 2013.
- No decision on a mission will be made before early 2016.
  - Interim report by SDT and project due by April 2014.
  - Final report by SDT and project due by January 31, 2015.
  - CATE due February 27, 2015.
- NASA will request a study by the CAA in early CY 2016 of SDT reports in context of Decadal Survey recommendations.

Kepler and Exoplanets

Program Update - Kepler

- Safe-mode entered on May 12, clear indication of loss of reaction wheel #4.
- Configuration commanding to complete set-up for Point Rest State (loose standby attitude using thrusters) completed.
  - Commanded transition to Point Rest State (PRS) May 15.
  - Fuel burn in PRS has been measured to be similar to science ops and will allow time for analysis and planning.
- Science Processing continues and is on schedule.
- Last attempt to recover 3-wheel operations commences July 18.
  - Wheel 4 on July 18, Wheel 2 on July 22.
- Second Kepler Science Conference planned for Nov 2013 (pending waiver approval).
  - Due to budget and travel constraints the Second Kepler Science Conference will allow virtual attendance.
- Schedule for go forward plan is being developed.
  - It will include definition of 2-wheel operations approach, scoping of implementation of 2-wheel operations, and assessment of science capabilities under 2-wheel capabilities.



Kepler

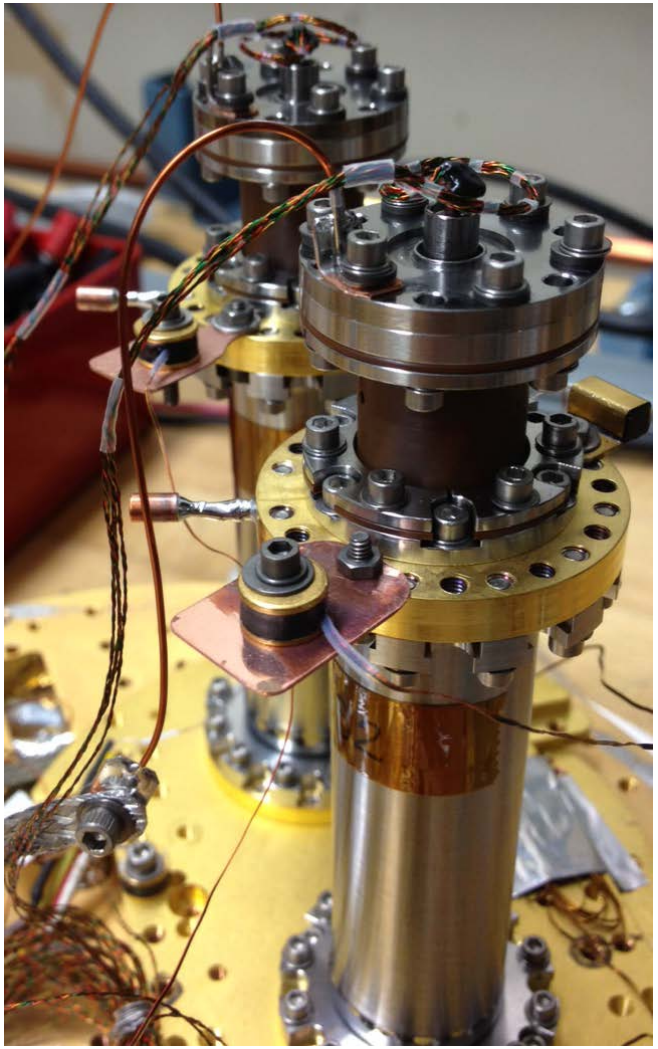
Program Update – SOFIA

April 11, 2013

SOFIA in Christchurch NZ on Sunday July 14.

Program Update - ASTRO-H

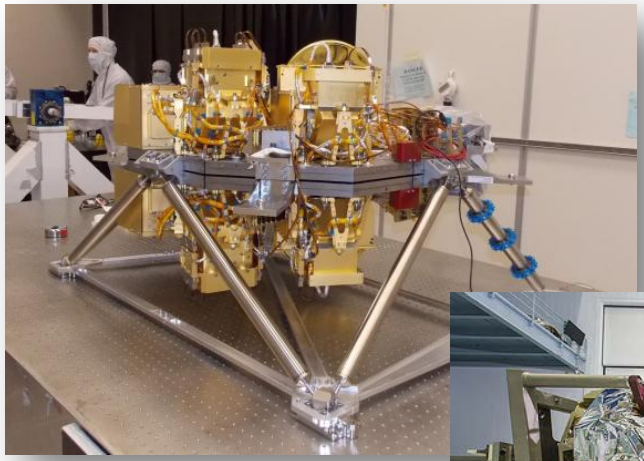
- Flight and Flight Spare detector assemblies are complete.
- Progress on Adiabatic Demagnetization Refrigerators (ADR's) is on track.
  - Two of four flight model heat switches are completed and in performance testing.
  - GLF salt pill and magnet assemblies are in fabrication.
- NASA team is on track to deliver flight model instrument to Japan in February 2014.
- Unexpectedly large vibrations detected during instrument-level environmental testing of engineering model hardware in Japan (Nov-Dec 2012). SXS instrument resolution could be impacted.
  - Additional testing conducted in Japan to identify source and scope of problem. NASA team has supported the added tests.
- SMD Program Management Council will set a new mission cost cap later this year.
  - Cost growth dues to JAXA schedule changes and supporting additional JAXA testing.



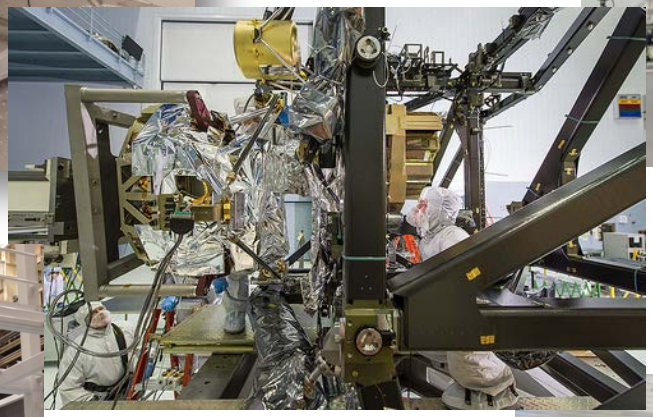
Flight Model Heat Switches being prepared for functional testing

Program Update - JWST

NIRCam modules mated



Backplane Center Section and
Backplane Support Fixture

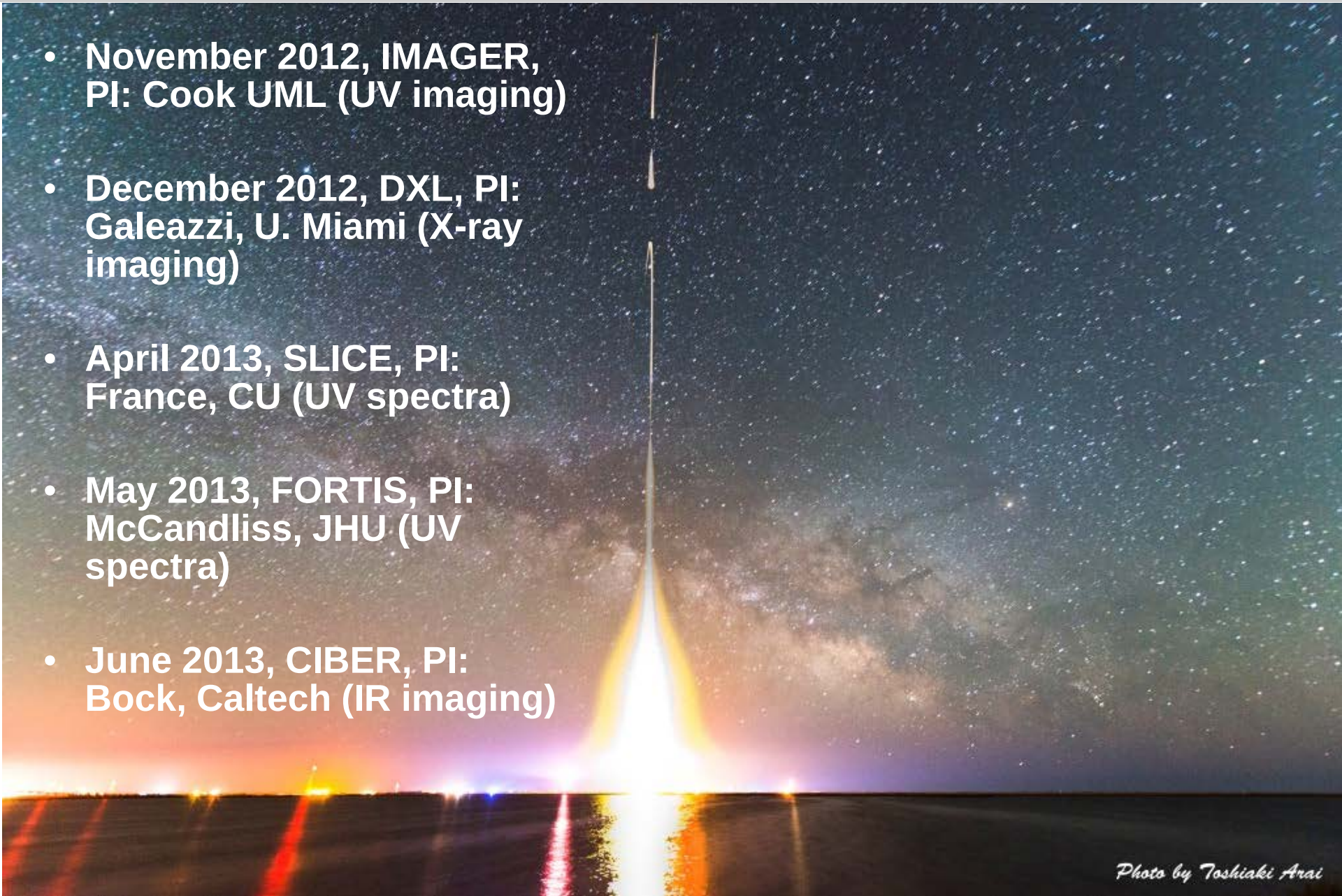


MIRI and FGS/NIRISS
installed in ISIM

Cleanroom construction
At JSC continues on schedule

Full-scale Engineering Sunshield Complete

FY2013 APD Sounding Rocket Launches



- November 2012, IMAGER, PI: Cook UML (UV imaging)
- December 2012, DXL, PI: Galeazzi, U. Miami (X-ray imaging)
- April 2013, SLICE, PI: France, CU (UV spectra)
- May 2013, FORTIS, PI: McCandliss, JHU (UV spectra)
- June 2013, CIBER, PI: Bock, Caltech (IR imaging)

Program Update – Operating Missions

Mission	Launch	NASA approved through Date	Phase	June	Comments
Hubble	1990-04-24	2016-09-30	Prime	G	Selected 249 Cycle 21 proposals. ~1000 submitted.
Chandra	1999-07-23	2016-09-30	Ext	G	Cycle 15 TAC upcoming. ~650 proposals received.
XMM-Newton	1999-12-10	2015-03-31	Ext	G	ESA Senior Review later this year. Cycle 13 proposals due in October.
GALEX	2003-04-28	2012-02-07	Past		GALEX returned to NASA April. Engineering test were run. Spacecraft was shut down on June 29.
Spitzer	2003-08-25	2014-09-30	Ext	G	Cycle 10 proposals due August 2.
Swift	2004-11-20	2016-09-30	Ext	G	
Suzaku	2005-07-10	2015-03-31	Ext	G	Cycle 9 proposals due in Fall.
Fermi	2008-06-11	2016-09-30	Prime	G	Cycle 6 selections announced. More info in later chart.
Kepler	2009-03-07	2016-09-30	Ext	R	Wheel 4 failed on May 12. Spacecraft in Point Rest State. More info in separate chart.
Herschel	2009-05-14	2013-06-17	Close out		Helium was depleted on April 29. Spacecraft was shutdown by ESA on June 17, 2013.
Planck	2009-05-14	2013-08	Ext	G	LFI-only sky survey on track for October 23 completion.
NuSTAR	2012-06-13	2014-08-01	Prime	G	Prime mission proceeding as planned.

Note: End dates beyond 2014 are pending approval in the 2014 Senior Review process.

G On plan, adequate margin

Y Problems, working to resolve within planned margin

R Problems, not enough margin to recover

2013 NASA Astrophysics Postdoc Fellows

Sagan Fellows

Name	Host Institution
Jared Males	Univ of Arizona, Tucson
Katja Poppenhaeger	CfA
Avi Shporer	JPL
Jacob Simon	SWRI
Jennifer Yee	Caltech

Einstein Fellows

Name	Host Institution
Claude-Andre Faucher Giguere	UC Berkeley
Javiera Guedes	Princeton Univ
James Guillchon	Harvard Univ
Rutger van Haasteren	JPL
Yan-Fei Jiang	SAO
Tim Linden	University of Chicago
Mario Manuel	Univ of Michigan, Ann Arbor
Selma De Mink	Carnegie Observatories
Krzysztof Nalewajko	Univ of Colorado, Boulder
Maria Petropoulou	Purdue University
Luke Roberts	Caltech
Alexander Tchekhovskoy	LBNL

Hubble Fellows

Name	Host Institution
Rachel Bezanson	Univ of Arizona, Tucson
Francesca DeMeo	Harvard College Observatory
Ruobing Dong	LBNL
Jacqueline Faherty	Carnegie Inst of Washington
Renyu Hu	JPL
Andreas Kuepper	Columbia Univ
Emily Levesque	Univ of Colorado, Boulder
Adam Miller	JPL
Philip Muirhead	Boston Univ
Ondrej Pejcha	Princeton Univ
Joseph Richards	LBNL
Pier-Emmanuel Tremblay	STScI
Jonathan Trump	Penn State Univ
Daniel Weisz	UC Santa Cruz
Jessica Werk	UC Santa Cruz
Zhaohuan Zhu	Princeton Univ
Adi Zitrin	Caltech

Proposal Selections Since January 2013

Status: July 17, 2013

	Proposal Due Date	Notify Date	Days since received	Number received	Number selected	% selected
Roman Tech Fellowships	Nov 8	Mar 5	117	12	2	17%
Fermi GI Cycle 6	Jan 18	May 16	118	233	50	21%
Kepler GO Cycle 5	Jan 18	April 15	87	63	25	40%
TCAN with NSF	Feb 14	June 20	126	106	20*	19%
Kepler Participating Sci.	Mar 1	July 5	126	30	11	37%
Hubble GO Cycle 21	Mar 1	May 30	90	1094	249	23%
Chandra GO Cycle 15	Mar 14		[125]	636		
APRA (basic research)	Mar 22		[117]	182		
SAT (technology)	Mar 22		[117]	39		
ADAP (data analysis)	May 17		[61]	274		**
Origins of Solar Sys.	May 23		[55]	41		**
SOFIA GO Cycle 2	Jun 28		[19]	89/22	(US/German)	
ATP (theory)	Jul 12		[5]	190		**
Spitzer GO Cycle 10	Aug 2					
Swift GI Cycle 10	Sep 26					**

* Includes 10 anticipated NSF TCAN proposal selections.

** ROSES-13 (earlier are ROSES-12)

Astrophysics Senior Reviews in 2014

There will be two Astrophysics Senior Reviews (SR's) in CY14:

- A Mission Senior Review (in conformity with PL 109-155, § 304(a)).
  - Coordinated calls for Hubble, Chandra, and the remainder of the MO&DA portfolio to be held in the March 2014 timeframe.
  - Missions will be required to submit self-identified Prioritized Science Goals (PSGs) as well as budgets, FTE and WYE levels.
  - All missions required to submit in-guide proposals, except where there are no current guidelines.
- An Archive Senior Review approximately 1 month later (April 2014).
  - Assess the curation and archiving of taxpayer-funded research data and metadata.
  - Assess a joint proposal on maintaining the core infrastructure of the Virtual Astronomical Observatory.
  - Address the goals of the new Presidential mandate for Open Data.
  - Archives also required to submit budgets, similar to the missions.
- Prioritized Science Goals required to make the missions as effective and efficient as possible in an era of declining budgets.
  - These PSGs used as metrics for reporting purposes.
  - Future Senior Reviews will use PSGs to track success in meeting established extended mission goals.

Community Participation

PhysPAG

- Executive Cmte: 7 members
- SAGs: 5 Active
- Chair: John Nousek
- Website: http://pcos.gsfc.nasa.gov/physpag

COPAG

- Executive Cmte: 9 members
- SAGs: 5 Active
- Chair: Ken Sembach
- Website: http://cor.gsfc.nasa.gov/copag

ExoPAG

- Executive Cmte: 10 members
- SAGs: 3 Active
- Chair: Scott Gaudi
- Website: http://exep.jpl.nasa.gov/exopag

Science and Technology Definition Teams (STDTs) in Progress:

- AFTA use of telescope assets: 20 members
- Exoplanet Probe with Internal Coronagraph: 10 members
- Exoplanet Probe with External Occulter: 10 members
- X-ray Probe: To be formed later in 2013

Preliminary reports from the studies are due Spring 2014.
Final reports from the studies are due in January 2015.

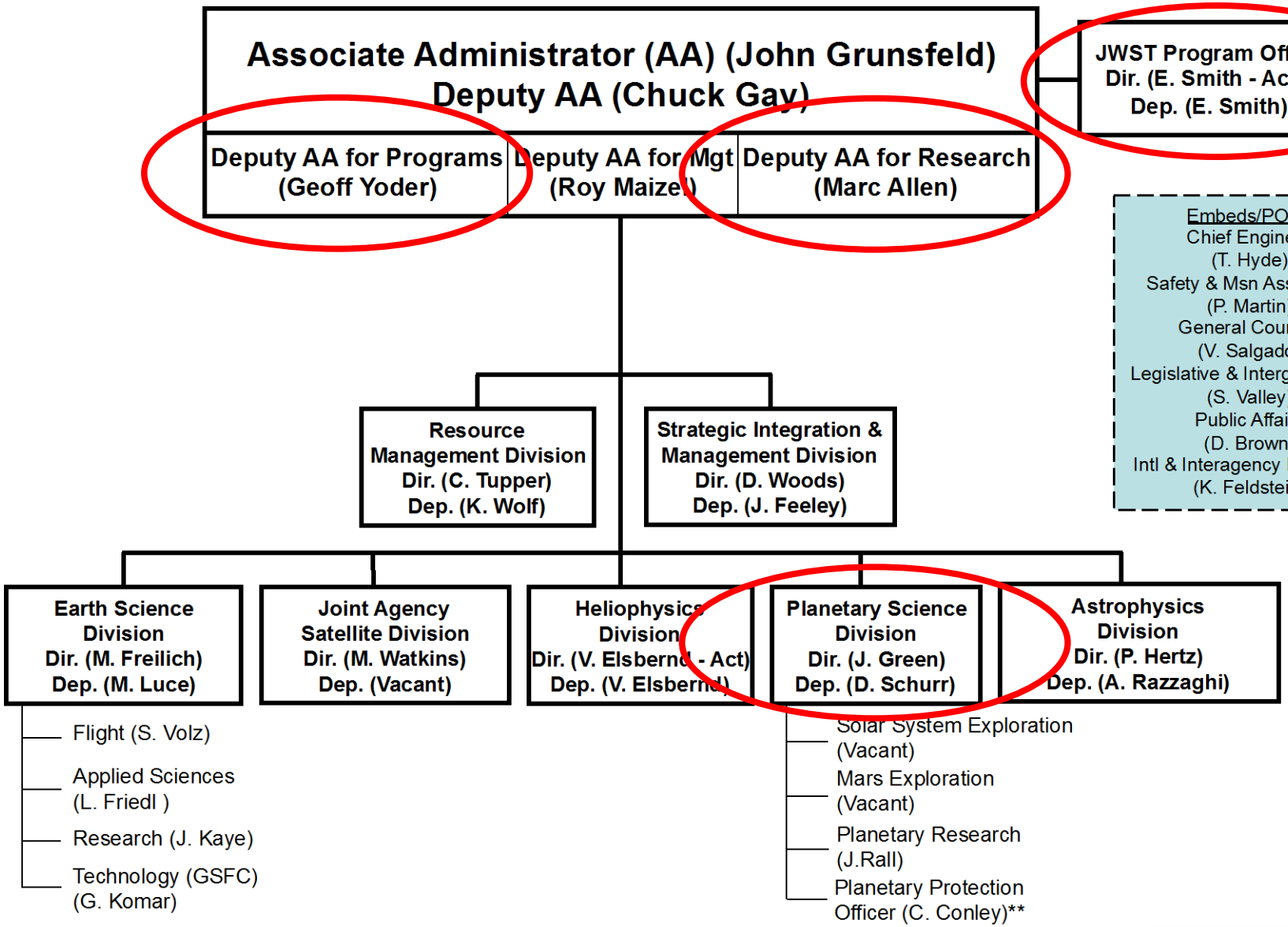
Advisory Committees (and next meetings)**:**

- NRC Committee on Astronomy and Astrophysics (CAA): TBD
- NASA Advisory Council's Astrophysics Subcommittee (APS): Nov (telecon)
- Astronomy and Astrophysics Advisory Committee (AAAC): Nov 13-14

Community Participation

- We are updating the charters for the PhysPAG and COPAG to recognize the two classes of community subgroups
  - A PAG may choose to organize sub-groups (e.g., Science Analysis Groups - SAGs and/or Science Interest Groups – SIGs) to deal with specific issues and report their findings to the full group.
  - SAGs are typically tasked with reporting on a specific issue, and when the analysis of that issue is complete the SAG is disbanded.
  - SIGs are typically tasked with collecting community input from a specific community on a longer-term basis.

SMD Organization

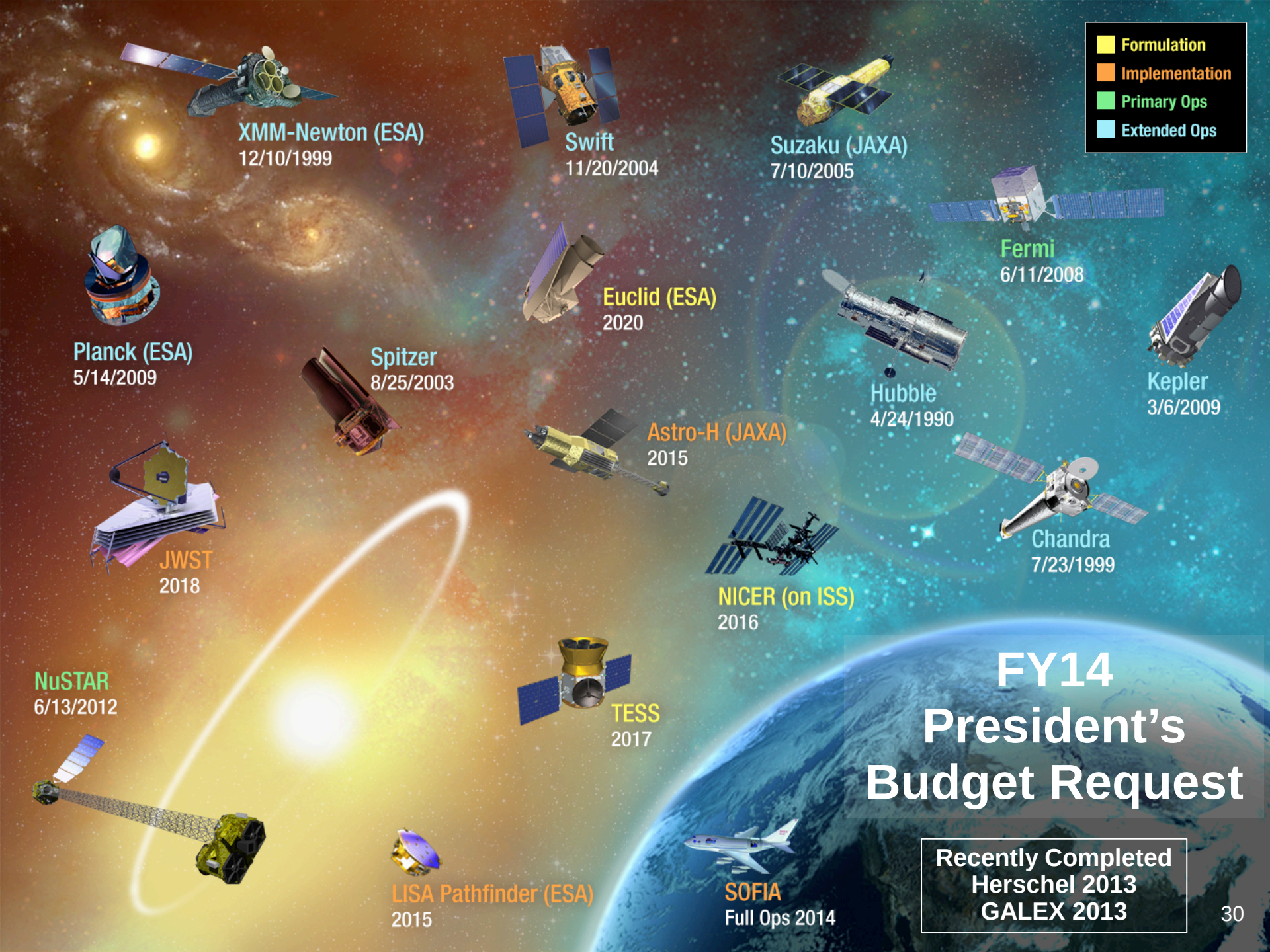


* Direct report to NASA Associate Administrator
** Co-located from the Front Office

June 2013

SMD Highlights

- Recent launches
  - IRIS (Interface Region Imaging Spectrograph) launched June 27, 2013, on a Pegasus rocket @ VAFB
- Upcoming Launches this year
  - LADEE (Lunar Atmosphere and Dust Environment Explorer) – September 6, 2013, on a Minotaur V rocket @ WFF
  - MAVEN (Mars Atmosphere and Volatile Evolution) - November 18, 2013, on an Atlas V rocket @ CCAFS
- Missions Recently Confirmed
  - OSIRIS-REx (Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer) (launch in 2016)
- Congressional Hearings
  - *Exoplanet Discoveries: Have We Found Other Earths?* Joint hearing by House Subcommittees on Space and Research, May 9, 2013
  - *STEM Education: The Administration's Proposed Reorganization*. Hearing by House Committee on Science, Space, and Technology, June 4, 2013


Formulation
Implementation
Primary Ops
Extended Ops
XMM-Newton (ESA)
12/10/1999
Swift
11/20/2004
Suzaku (JAXA)
7/10/2005
Fermi
6/11/2008
Euclid (ESA)
2020
Planck (ESA)
5/14/2009
Spitzer
8/25/2003
Hubble
4/24/1990
Kepler
3/6/2009
Astro-H (JAXA)
2015
JWST
2018
Chandra
7/23/1999
NICER (on ISS)
2016
NuSTAR
6/13/2012
TESS
2017
LISA Pathfinder (ESA)
2015
SOFIA
Full Ops 2014
FY14
President's
Budget Request
Recently Completed
Herschel 2013
GALEX 2013

FY13 Appropriation

- Congress appropriated $659M for Astrophysics and $628M for JWST.
  - Astrophysics appropriation is $10M over FY13 PBR, earmarked for WFIRST.
  - JWST appropriation is what was requested.
- Rescission (~1.8%), Sequester (~5%), and other budget adjustments will result in an FY13 Astrophysics budget significantly lower.
  - Exact amounts applied to Astrophysics are not public until the operating plan has been submitted to Congress and agreed upon.
  - Estimating the reduction at 6.8% is a ROM estimate to astrophysical accuracy.
- Astrophysics will take reductions in the following areas first.
  - Reduce carry-over for operating missions, includes rephasing of GO funds.
  - Rephase unneeded FY13 reserves for developing missions.
  - Rephase R&A funding until FY14 for some PIs, reduced selections.
  - Slow down development of current and future Explorers.
  - Postpone needed upgrades in infrastructure programs.
- Impacts will include.
  - Lowered R&A selection rates in 2013 (for FY14 funding).
  - Delays in future Explorer AOs.
  - Other reductions in FY14 where funding requirements were deferred.

FY13 Appropriation – R&A impacts

- Sequestration and other changes in the APD planning budget have an impact on Research and Analysis programs
  - Sequestration of funding in FY13 has been handled, in part, by making fewer selections for new awards requiring FY13 funding and by delaying funding until FY14 for those continuing PIs who indicate there is little or no impact
  - Delayed finalization of FY13 budget means some new awards cannot be started in FY13 and will be deferred to FY14
- Some specific impacts of FY13 sequestration and other known changes
  - ATP-12 and OSS-12 have fewer selections (requires FY13 funding)
  - ATP-12 and OSS-12 have some new funding starts delayed until FY14
  - TCAN-12 has all new funding starts delayed until FY14
- Some potential impacts of sequestration in FY14
  - APRA-12 will have fewer selections (requires FY14 funding)
  - ADAP-13 and OSS-13 will have fewer selections (requires FY14 funding)
  - ATP-13 will have new funding starts delayed to FY15 (reduces FY14 funding requirements)
  - RTF-13 impact TBD (unknown availability of FY14 funding)

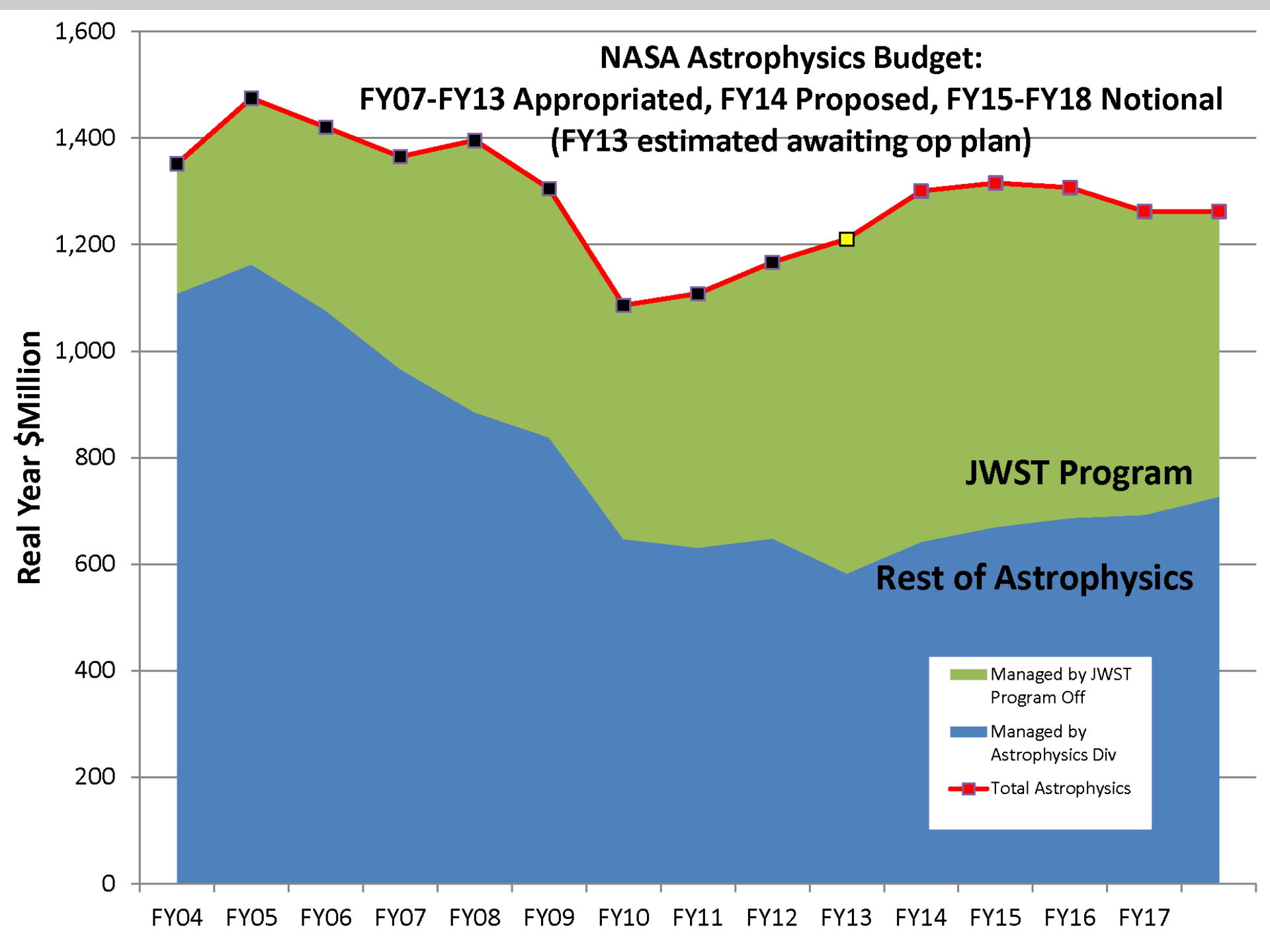
Astrophysics FY14 Budget Features

What's changed (since the President's FY13 budget request in 2/12)

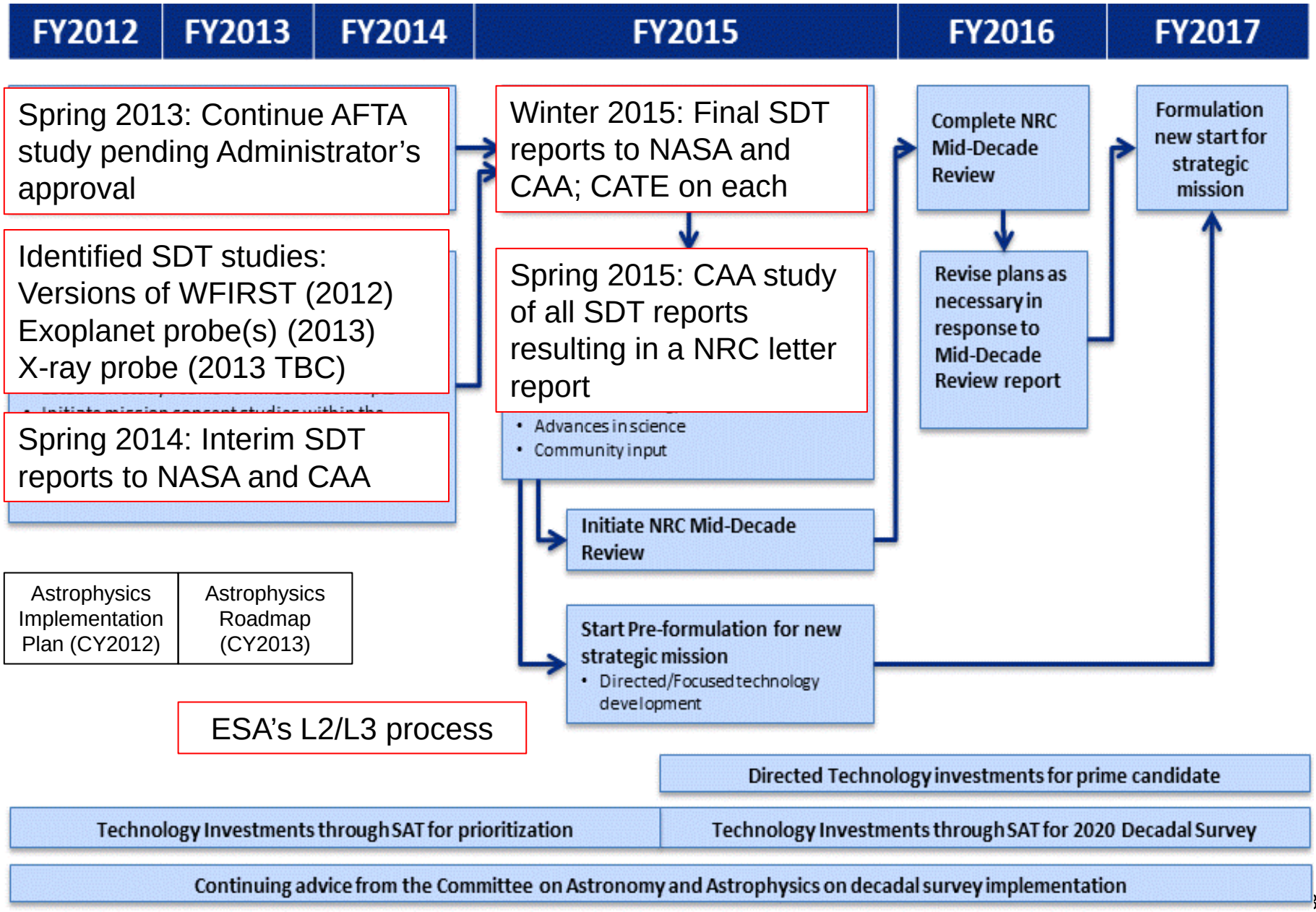
- A new Explorer mission (TESS) and a new Explorer Mission of Opportunity (NICER) downselected for development leading to flight.
- New Euclid project created in PCOS program to fund hardware procurement and US science team.
- Spitzer, Planck, Chandra, Fermi, XMM, Kepler, Swift, and Suzaku extended per the recommendation of the 2012 Senior Review.
- Efficiencies in Fermi mission operations implemented in FY14, ahead of schedule and resulting in a significant reduction of operating costs, plus reduced GI selections for one year.
- Budget does not support selections for the 2012 Astrophysics Explorer Mission of Opportunity AO.

What's the same

- JWST funded to maintain progress toward 2018 launch.
- Hubble, SOFIA, NuSTAR, Astro-H, ST-7, Balloons, Sounding Rockets, R&A, Archives.
- Budget for large decadal survey mission begins to grow in FY17.


NASA Astrophysics Budget:
FY07-FY13 Appropriated, FY14 Proposed, FY15-FY18 Notional
(FY13 estimated awaiting op plan)
Real Year $Million
1,600
1,400
1,200
1,000
800
600
400
200
0
FY04
FY05
FY06
FY07
FY08
FY09
FY10
FY11
FY12
FY13
FY14
FY15
FY16
FY17
JWST Program
Rest of Astrophysics
Managed by JWST Program Off
Managed by Astrophysics Div
Total Astrophysics

Astrophysics Near-term Strategy



Astrophysics Roadmap

- Community abstracts on science and technology challenges received on March 25.
- 1st face-to-face meeting at Goddard March 27-28.
- Virtual Town Hall held May 6-7.
- 2nd face-to-face meeting at JPL June 10-11.
- July 16-17 Astrophysics Subcommittee meeting.
  - Roadmap chair present themes to APS for discussion and approval.

- July – October: report writing
- October 21 (TBC): submit to Astrophysics Subcommittee for comments
- Two weeks later: comments due from APS members
- November APS telecon meeting: Presentation of roadmap to APS for discussion and approval
- December: report publication.

Separate presentation of roadmap themes by Roadmap chair

Exoplanet Probe STDTs

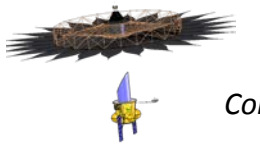
- The STDTs will produce two Exoplanet mission concepts ($1B LCC) that will advance Astro2010 exoplanet science, prioritize technology investments for the remainder of the decade, serve as potential backups for APD if AFTA is not selected as the next strategic mission, and otherwise become candidates for consideration by Astro2020.
- APD issued a call for self-nominations – January 2013.
- Selection and Announcement of STDTs by APD DD – May 2013.
  - Internal Occulter (Coronagraph) – Karl Stapelfeldt, GSFC, Chair
  - External Occulter (Starshade) – Sara Seager, MIT, Chair
- One Program Study Office consisting of two collaborating Design Teams formed June 2013.
- Joint Kick off meeting of Exoplanet STDTs and Program Study Office – July 1-2, 2013.
- Interim report by STDTs and Program Study Office by April 2014.
- Final report by STDT and Program Study Office by January 31, 2015.
- CATE due February 27, 2015.

Exoplanet Probe STDTs

- Logistics Telecon May 16
- First joint meeting July 1-2, GSFC

Probe-Scale:

External Occulter (Starshade)



Coronagraph

Probe Scale Exoplanet Mission STDTs		
Coronagraph STDT		
Last	**First**	**Organization**
* Stapelfeldt	Karl	NASA Goddard Space Flight Center
Belikov	Rus	NASA Ames Research Center
Bryden	Geoff	Jet Propulsion Laboratory
Cahoy	Keri	Massachusetts Inst. of Technology
Chakrabarti	Supriya	Univ. of Massachusetts, Lowell
Marley	Mark	NASA Ames Research Center
McElwain	Michael	NASA Goddard Space Flight Center
Meadows	Vikki	Univ. of Washington
Serabyn	Gene	Jet Propulsion Laboratory
Trauger	John	Jet Propulsion Laboratory
* Chair		
Starshade STDT		
Last	**First**	**Organization**
* Seager	Sara	Massachusetts Inst. of Technology
Cash	Webster	Univ. of Colorado
Domagal-Goldman	Shawn	NASA Goddard Space Flight Center
Kasdin	N. Jeremy	Princeton Univ.
Kuchner	Marc	NASA Goddard Space Flight Center
Roberge	Aki	NASA Goddard Space Flight Center
Shaklan	Stuart	Jet Propulsion Laboratory
Sparks	William	Space Telescope Science Institute
Thomson	Mark	Jet Propulsion Laboratory
Turnbull	Margaret	Global Science Institute
* Chair		

Karl Stapelfeldt

Goddard Space Flight Center

Chair Coronagraph STDT

Sara Seager

MIT

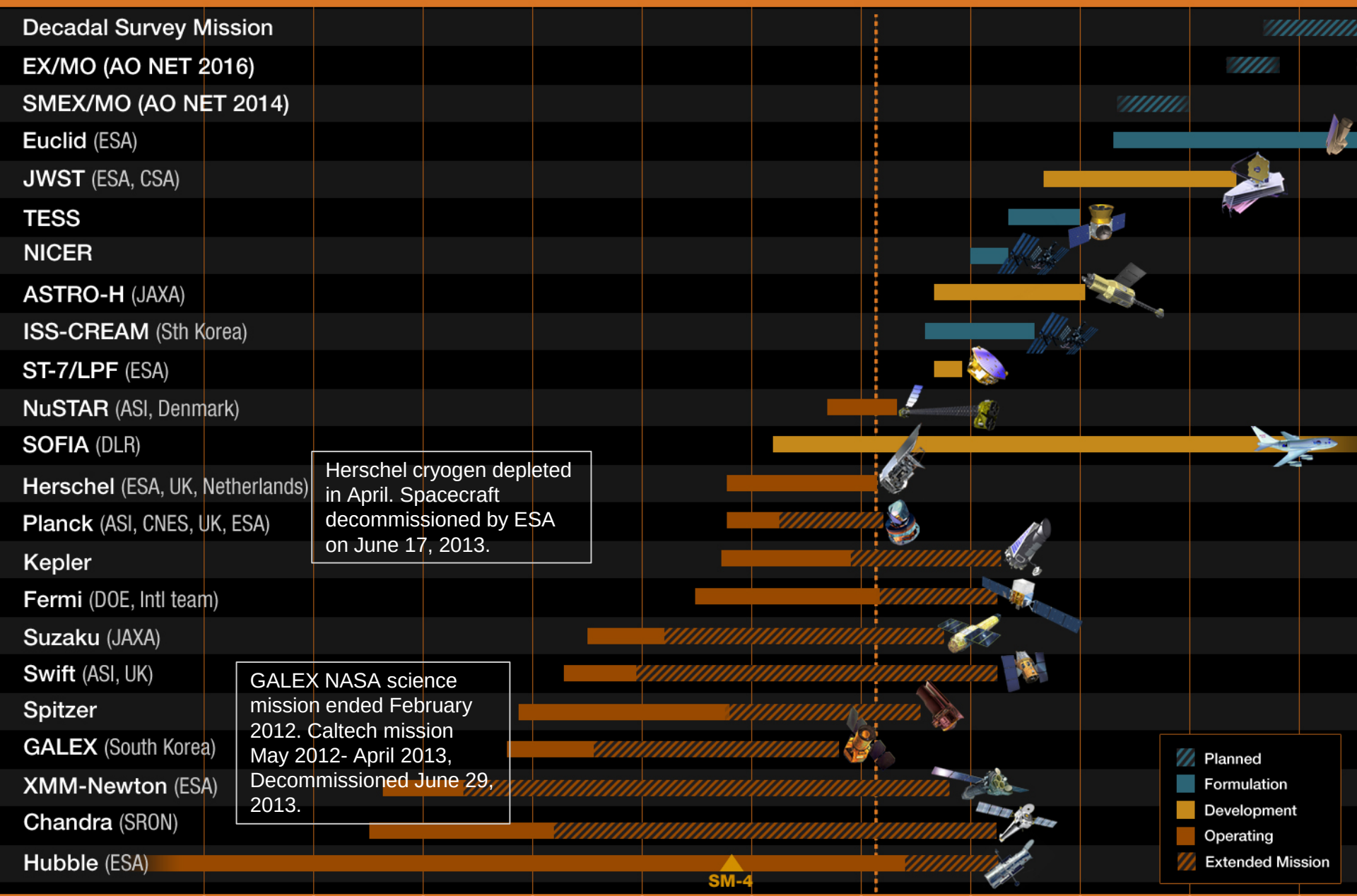
Chair Starshade STDT

X-Ray Probe STDT

- X-ray Probe Science and Technology Definition Team will optimize the scientific and technical options for a probe-class mission to meet the X-ray science goals and program prioritizations of the Decadal Survey, following the spectroscopy studies of the X-ray Concept Study Team in 2012
- Note: if ESA L2 selection is an X-ray mission, and NASA and ESA decide to collaborate on that mission, the X-ray probe STDT will be disbanded and this option will no longer be pursued.
- Schedule for X-ray Probe STDT:
  - APD issues a call for self-nominations for X-ray probe STDT – August 2013.
  - Due date for self-nominations – September 2013.
  - Selection of STDT by APD DD – September 2013.
  - Kick off meeting of x-ray STDT – October 2013 (TBC after STDT selection).
  - Interim report by STDT and project by April 2014.
  - Final report by STDT and project by January 31, 2015.
  - CATE due February 27, 2015.

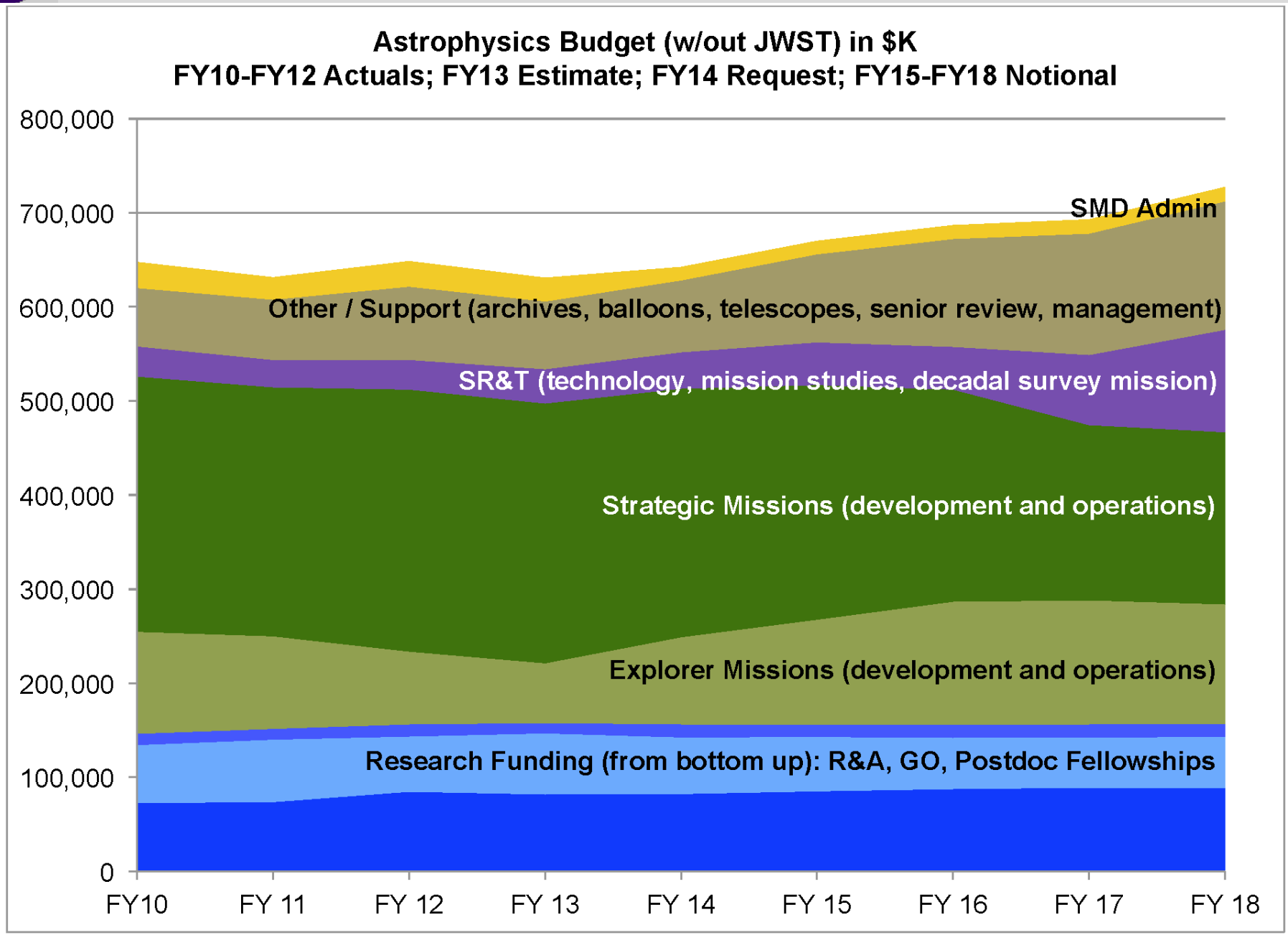
Astrophysics Missions timeline

Last updated: June 29, 2013



Backup

Astrophysics Balance (w/out JWST)



Exoplanet Hearing (May 9, 2013)

Purpose

- The purpose of the hearing is to review the recent discovery of three super-Earth sized planets by the National Aeronautics and Space Administration's (NASA) Kepler space telescope. The hearing will also assess the state of exoplanet surveying, characterization, and research; NASA's Exoplanet Exploration Program; National Science Foundation's (NSF) Division of Astronomical Science; as well as coordination within the government and with external partners. NASA and NSF both contribute to the search for exoplanets. NASA provides space-based telescopes to identify potential planets, while NSF builds ground-based telescopes. Both agencies fund research that assists in categorizing and characterizing candidate planets.

Witnesses

- Dr. John Grunsfeld, Associate Administrator, Science Mission Directorate, NASA;
- Dr. James (Jim) Ulvestad, Division Director, Division of Astronomical Sciences, Directorate
- for Mathematical and Physical Sciences, NSF;
- Dr. Laurance Doyle, Principal Investigator, Center for the Study of Life in the Universe, SETI Institute, and member of the NASA Kepler Mission Science Team.

STEM Hearing (June 4, 2013)

Purpose

- On Tuesday, June 4, 2013, the House Committee on Science, Space, and Technology will hold a hearing to review the Administration's proposed consolidation and re-organization of federal science, technology, engineering, and mathematics (STEM) programs. With an eye toward COMPETES Act (P.L. 111-358) reauthorization of the National Science Foundation (NSF) and a review of the effectiveness and efficiency of interagency STEM education programs this hearing will provide an opportunity to evaluate the Administration's proposal and how it will affect federal STEM efforts across the Nation.

Witnesses

- The Honorable John Holdren, Director, Office of Science and Technology Policy (OSTP), Executive Office of the President
- Dr. Joan Ferrini-Mundy, Assistant Director, Directorate for Education and Human Resources, National Science Foundation (NSF)
- Mr. Leland D. Melvin, Associate Administrator for Education, National Aeronautics and Space Administration (NASA)

Proposed STEM Reorganization

	FY 2012 Enacted	FY 2014 Request	Change FY12-14 Amount	Change FY12-14 Percent
Agriculture	88	85	-3	-3.7%
Commerce	41	36	-5	-12.7%
Defense	178	136	-42	-23.6%
Education	529	814	285	53.9%
Energy	47	33	-14	-29.9%
HHS	578	533	-45	-7.8%
DHS	9	9	-1	-8.5%
Interior	3	3	0	-9.0%
Transportation	99	92	-8	-7.5%
EPA	26	3	-22	-86.8%
NASA	149	100	-49	-32.9%
NSF	1,154	1,243	89	7.7%
NRC	16	1	-15	-95.5%
Smithsonian	0	25	25	--
Total STEM Education	**2,918**	**3,112**	**195**	**6.7%**

Astrophysics Division Organization Chart

Resource Management
Omana Cawthon +
Peifen Anawalt +

Director
Paul Hertz
Deputy Director
Andrea Razzaghi

Lead Secretary: Leslie Allen (acting)
Secretary: Christie Ashley *
Program Support Specialist: Sheila Gorham

Cross Cutting
Technology Lead: William (Billy) Lightsey *
Strategic Integration: Joan Centrella *
Division E/PO POC: Hashima Hasan (Lead Comm Team)
Division PAO POC: Lisa Wainio *
Information Manager: Lisa Wainio *

Astrophysics Research

Program Manager: Linda Sparke
Program Support: Janet Larson *
Astrophysics Data Analysis: Doug Hudgins, Debra Wallace
Astrophysics Theory: Linda Sparke
Origins of Solar Systems: Larry Petro *
APRA lead: Michael Garcia *
Cosmic Rays, Fundamental Physics: Joan Centrella*, Vernon Jones, Keith MacGregor*
Gamma Ray/X-ray: Michael Garcia*, Lou Kaluzienski, Wilt Sanders*
Optical/Ultraviolet: Michael Garcia, Richard Griffiths, Hashima Hasan, Mario Perez *, Larry Petro *
IR/Submillimeter/Radio: Richard Griffiths, Doug Hudgins, Larry Petro, Glenn Wahlgren*
Lab Astro: Glenn Wahlgren*
Data Archives: Hashima Hasan
Astrophysics POC for Sounding Rockets: Wilt Sanders *
Balloons Program: Vernon Jones (PS), Mark Sistilli (PE)

May 1, 2013

Programs / Missions

	Program Scientist	*Program Executive*
Exoplanet Exploration (EXEP)		
LEADS	**Doug Hudgins**	**Tony Carro ***
Keck	Hashima Hasan	Mario Perez *
Kepler	Doug Hudgins	Tony Carro *
LBTI	Hashima Hasan	Mario Perez *
NExScI	Hashima Hasan	Mario Perez *
Cosmic Origins (COR)		
LEADS	**Michael Garcia ***	**John Gagosian**
Herschel	Glenn Wahlgren *	John Gagosian
Hubble	Richard Griffiths *	John Gagosian
JWST	Hashima Hasan	N/A
SOFIA	Glenn Wahlgren *	John Gagosian
Spitzer	Glenn Wahlgren *	Jeff Hayes *
Physics of the Cosmos (PCOS)		
LEADS	**Richard Griffiths ***	Lia LaPiana
Chandra	Wilt Sanders *	Lia LaPiana
Euclid	Richard Griffiths *	Lia LaPiana
Fermi	Lou Kaluzienski	Lia LaPiana
Planck	Joan Centrella *	Lia LaPiana
ST-7/LPF	Wilt Sanders *	Anne-Marie Novo-Gradac
XMM-Newton	Lou Kaluzienski	Jeff Hayes *
Astrophysics Explorers (APEX)		
LEADS	**Wilt Sanders ***	**Anne-Marie Novo-Gradac**
Astro-H	Lou Kaluzienski	Anne-Marie Novo-Gradac
NICER	Rita Sambruna	Jeanne Davis *
NuSTAR	Lou Kaluzienski	Mark Sistilli
Suzaku	Lou Kaluzienski	Jeff Hayes *
Swift	Michael Garcia *	Jeff Hayes *
TESS	Doug Hudgins	Mark Sistilli
WISE	Hashima Hasan	Anne-Marie Novo-Gradac

+ Member of the Resources Mgmt Division
** Detailee, IPA, or contractor*
JWST now part of the JWST Program Office.

Kelly Johnson on detail until Aug. 2013.
Rita Sambruna on detail until Sept. 2013

Astrophysics Earth Science
Heliophysics Planetary Science

Total Missions / Spacecraft
97 / 121

2013-Jun-18

Joint Agency Satellite Division (JASD)
NOAA Reimbursables

Formulation 16 / 24

JPL 5 / 6
InSight 3/8/2016
GRACE FO (1/2) 8/5/2017
OCO-3 Late 2017
Euclid 3/2020
SWOT 10/2020

GSFC 9
DSCOVR 11/15/2014
Polar Free Flyer NET 8/2016
JPSS-1 11/15/2016
NICER (MO): 11/2016
ICON: 11/2016
TESS: 6/2017
GOLD (MO): 9/2017
Solar Probe + 7/31/2018
MOMA-MS 2018

LaRC 2 / 9
CYGNSS (1/8) 10/2016
TEMPO NET 11/2018

Implementation 22 / 26

LaRC 1
SAGE-3/ISS 8/2014

GRC 1 / 0
ASRG
F1: 10/19/2016
F2: 6/27/2017

ARC 1
LADEE 9/6/2013

JPL 4
OCO-2 7/1/2014
SMAP 10/31/2014
ST-7 NET CY2015
Jason-3 3/1/2015

GSFC 13/19
IRIS 6/26/2013
TCTE NET 10/30/2013
MAVEN 11/18/2013
GPM: 2/14/2014
MMS (1/4): 10/15/2014
Astro-H: NET CY2015
SET-1: 9/2015
GOES-R Series (1/4): 10/2015
ICESat-2: 7/28/2016
OSIRIS-REx: 9/4/2016
Solar Orbiter Collaboration: 1/2017
MetOp-C: 10/1/2017
JWST: 10/31/2018

DFRC 1 / 0
SOFIA (1/0) 10/4/2013 FOC

MSFC 1
Strofio 8/16/2015

Primary Ops 12 / 13

MSFC 1
New Horizons

JPL 5
NuSTAR
Rosetta
Dawn
Juno
MSL Curiosity

GSFC 6 / 7
Fermi
SDO
Suomi NPP~
Van Allen Probes (1/2)
Aquarius
Landsat 8~

Extended Ops 47 / 58

ARC 1
Kepler

JPL 15/17
Spitzer
Planck
CloudSat
ACRIMSAT
GRACE (1/2)
Jason-1
OSTM/Jason-2~
QuikSCAT
Voyager (1/2)
Mars Express
Mars Odyssey
MER Opportunity
Cassini
MRO
Deep Impact

MSFC 3
Chandra
Hinode
MESSE-NGER

GSFC 27/36
HST
Suzaku
EO-1
XMM
Swift
Aqua
SORCE
IBEX
Terra
TRMM
Landsat 7~
ARTEMIS (1/2)
THEMIS (1/3)
STEREO (1/2)
GEOTAIL
Cluster-2 (1/4)
TWINS-A & B (1/2)

LaRC 1
CALIPSO
ACE
CINDI
AIM
RHESSI
SOHO
TIMED
WIND
LRO
LAGEOS (1/2)

Div	Form	Imp	Pri Ops	Ext Ops	Total
Astro	3	4	2	8	**17**
Earth	5	5	3	15	**28**
Helio	3	4	2	16	**25**
Planet	2	5	5	8	**20**
JASD	3	4	NA	NA	**7**
Total	**16**	**22**	**12**	**47**	**97**

Italics = NASA instruments on commercial, DOD, or international spacecraft X / Y = # of missions / # of spacecraft
~ Operated by another agency
Updates: (1) Free Flyer-1 renamed to Polar Free Flyer.
(2) Added ASRG. (3) LDCM moved to Primary Ops & renamed Landsat 8.
(4) Program LRDs for TESS, NICER, ICON, & GOLD. (5) TCTE LRD NET changed from 10/10/2013 to 10/30/2013.
(6) TEMPO LRD changed from 2017 to NET 11/2018. (7) GRACE FO LRD changed from 8/2017 to 8/5/2017.

12 font: LCC > $1B
10 font: $250M < LCC < $1B
8 font: LCC < $250M
} for projects in formulation & implementation

Science Budget Request Summary

	FY2012	* FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
Science Total	**5073.7**	**5115.9**	**5017.8**	**5017.8**	**5017.8**	**5017.8**	**5017.8**
Earth Science	**1760.5**		**1846.1**	**1854.6**	**1848.9**	**1836.9**	**1838.1**
Earth Science Research	441.1		443.3	483.1	483.4	485.1	476.5
Earth Systematic Missions	879.9		787.5	811.2	861.9	839.1	833.3
Earth System Science Pathfinder	183.3		353.6	293.1	232.2	237.4	250.0
Earth Science Multi-Mission Operations	168.6		171.7	174.3	177.9	179.0	182.0
Earth Science Technology	51.2		55.1	56.2	55.1	56.1	56.1
Applied Sciences	36.4		35.0	36.7	38.4	40.1	40.1
Planetary Science	**1501.4**		**1217.5**	**1214.8**	**1225.3**	**1254.5**	**1253.0**
Planetary Science Research	174.1		220.6	233.3	229.1	230.4	232.2
Lunar Quest Program	139.9		17.7				
Discovery	172.6		257.9	268.2	242.3	187.5	215.0
New Frontiers	143.7		257.5	297.2	266.5	151.0	126.2
Mars Exploration	587.0		234.0	227.7	318.4	504.7	513.2
Outer Planets	122.1		79.0	45.6	24.4	26.4	26.4
Technology	161.9		150.9	142.8	144.7	154.4	140.0
Astrophysics	**648.4**		**642.3**	**670.0**	**686.8**	**692.7**	**727.1**
Astrophysics Research	165.5		147.6	170.6	192.3	207.2	218.5
Cosmic Origins	239.9		228.0	216.5	193.1	196.7	194.1
Physics of the Cosmos	108.3		110.4	107.5	100.0	82.8	86.4
Exoplanet Exploration	50.8		55.4	59.4	57.7	60.7	90.7
Astrophysics Explorer	83.9		100.9	116.0	143.8	145.3	137.4
James Webb Space Telescope	**518.6**		**658.2**	**645.4**	**620.0**	**569.4**	**534.9**
Heliophysics	**644.8**		**653.7**	**633.1**	**636.8**	**664.3**	**664.6**
Heliophysics Research	166.7		195.7	163.0	167.5	172.1	174.1
Living with a Star	196.3		216.2	277.7	332.6	353.9	374.4
Solar Terrestrial Probes	216.0		146.6	68.7	48.9	50.1	27.9
Heliophysics Explorer Program	65.8		95.2	123.7	87.9	88.2	88.2

FY 2015-FY 2018 estimates are notional

* FY2013 reflects pre-appropriation "annualized CR" rate; pending Operating Plan will be less than $4.8B after rescissions and sequestration

Astrophysics Program Content

	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
				(FY15-18 estimates are notional)			
Astrophysics	**648.4**		**642.3**	**670.0**	**686.8**	**692.7**	**727.1**
Astrophysics Research	165.5		147.6	170.6	192.3	207.2	218.5
Astrophysics Research and Analysis	68.6		65.7	68.3	70.2	71.5	71.5
Balloon Project	31.6		32.9	32.8	34.2	34.3	34.3
Other Missions and Data Analysis	65.3		49.1	69.4	87.9	101.3	112.7
Keck Single Aperture	2.3						
Astrophysics Data Analysis Program	16.4		17.0	17.0	17.6	17.6	17.6
Astrophysics Data Curation and Archival	20.0		18.2	19.1	19.1	19.1	19.1
Astrophysics Senior Review				13.9	24.5	35.8	41.0
Education and Public Outreach	12.9						
Contract Administration, Audit & QA Svcs	13.7		13.9	14.0	14.5	14.5	14.5
Astrophysics Directed R&T				5.4	12.3	14.3	20.5
Cosmic Origins	239.9		228.0	216.5	193.1	196.7	194.1
Hubble Space Telescope (HST)	98.3		96.3	92.3	88.2	88.2	83.9
SOFIA	84.2		87.4	87.3	85.2	85.1	86.2
Other Missions And Data Analysis	57.4		44.3	36.9	19.7	23.4	24.0
Spitzer	17.8		16.3	14.2			
Herschel	24.3		12.2	5.5	2.7	1.0	
Cosmic Origins SR&T	10.2		12.8	13.1	13.3	18.6	19.2
Cosmic Origins Future Missions	1.0		0.4	1.6	1.0	1.0	2.0
Cosmic Origins Program Management	4.1		2.6	2.6	2.7	2.8	2.9

Astrophysics Program Content (cont'd)

	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
				(FY15-18 estimates are notional)			
Physics of the Cosmos	108.3		110.4	107.5	100.0	82.8	86.4
Euclid	1.0		15.1	9.3	3.7	4.0	5.0
Chandra X-Ray Observatory	56.4		55.0	55.8	55.4	55.6	55.6
Fermi Gamma-ray Space Telescope	25.3		14.3	18.6	20.7		
Planck	7.1		6.2	4.1			
XMM-Newton	2.1		1.9	1.0			
Physics of the Cosmos SR&T	13.3		15.3	14.9	16.4	19.3	20.8
Physics of the Cosmos Program Mgmt	3.0		2.7	2.8	2.8	2.9	3.0
Physics of the Cosmos Future Missions	0.3			1.0	1.0	1.0	2.0
Exoplanet Exploration	50.8		55.4	59.4	57.7	60.7	90.7
Kepler	19.6		18.7	18.0	18.3		
Large Binocular Telescope Interferometer	2.0		2.9	2.0	0.5	0.5	
Keck Operations	3.2		5.8	6.0	6.1	6.1	6.2
Keck Interferometer	0.4						
Exoplanet Exploration SR&T	18.4		22.2	26.0	26.1	34.3	34.3
Exoplanet Exploration Program Mgmt	5.6		4.6	5.4	5.5	5.6	5.7
Exoplanet Exploration Future Missions	1.5		1.2	2.0	1.2	14.2	44.4

Astrophysics Program Content (cont'd)

	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
				(FY15-18 estimates are notional)			
Astrophysics Explorer	83.9		100.9	116.0	143.8	145.3	137.4
Astro-H (SXS)	16.2		1.3	0.9	0.9		
Swift	4.3		4.8	5.0	5.1		
Wide-Field Infrared Survey Explorer	4.5		0.2				
Suzaku (ASTRO-E II)	0.3		0.3	0.3			
Nuclear Spectroscopic Telescope Array	15.6		1.3	0.4			
GALEX	0.5						
Wilkinson Microwave Anistropy Probe	1.0						
Gravity and Extreme Magnetism SMEX	33.2						
Astrophysics Explorer Future Missions	2.7		86.0	105.8	130.9	137.9	133.4
Astrophysics Explorer Program Mgmt	5.6		7.0	3.5	6.8	7.4	4.0

Astro2010 Decadal Report Status - Response

Program Scale	Recommendation	Current Response FY14
Large	**WFIRST**	DRM1 and DRM2 completed in FY12; AFTA DRM completed in FY13; detector technology development begun in FY13; continued pre-formulation and technology development in FY14; decision regarding new start in FY15
Large	**Explorer** Augmentation	Impacted by sequester and budget reductions; EX AO in 2010; SMEX AO in 2014/2015; EX AO in 2016/2017; each AO has a mission and a MO
Large	**LISA** Technology	CST completed in FY12; technology supported through SAT; ST-7/LPF supported; will pursue partnership with ESA if a GW mission is selected for L2/L3 mission
Large	**IXO** Technology	CST completed in FY12; technology supported through SAT; X-ray probe SDT planned for 2013; will pursue partnership with ESA if an X-ray mission is selected for L2/L3 mission
Medium	**New Worlds Technology**	Technology supported through TDEM/SAT; SDTs started in FY13; AFTA coronagraph study in FY13; will consider partnership with ESA if an exoplanet mission is selected for L2/L3 mission; working with STMD on early-stage technology
Medium	**Inflation Probe Technology**	Technology supported through APRA including multiple suborbital payloads; will consider partnership with ESA if a CMB mission is selected for L2/L3 mission
Small	**Astrophysics Theory Program** Augmentation	Impacted by budget reductions
Small	(Definition of) a **future UV-optical space capability**	RFI in FY12; technology supported through APRA, SAT, and working with STMD
Small	**Intermediate Technology Development** Augmentation	SAT program initiated and funded for prioritized investments
Small	**Laboratory Astrophysics** Augmentation	Augmentation started in FY12 including selection of large consortium; impacted by budget reductions
Small	**SPICA** mission (U.S. contributions to JAXA-led)	Candidate for future Explorer Mission of Opportunity
Small	**Suborbital Program** Augmentation	Technology augmentation for balloon program; continued development of ULDB balloon platforms; ISS payload selections; future is impacted by budget reductions
Small	**Theory and Computation Networks** (NASA, NSF, DOE)	First NASA-NSF call in 2013 for FY14 funding
N/A	**Additional core program augmentations**	Impacted by budget reductions